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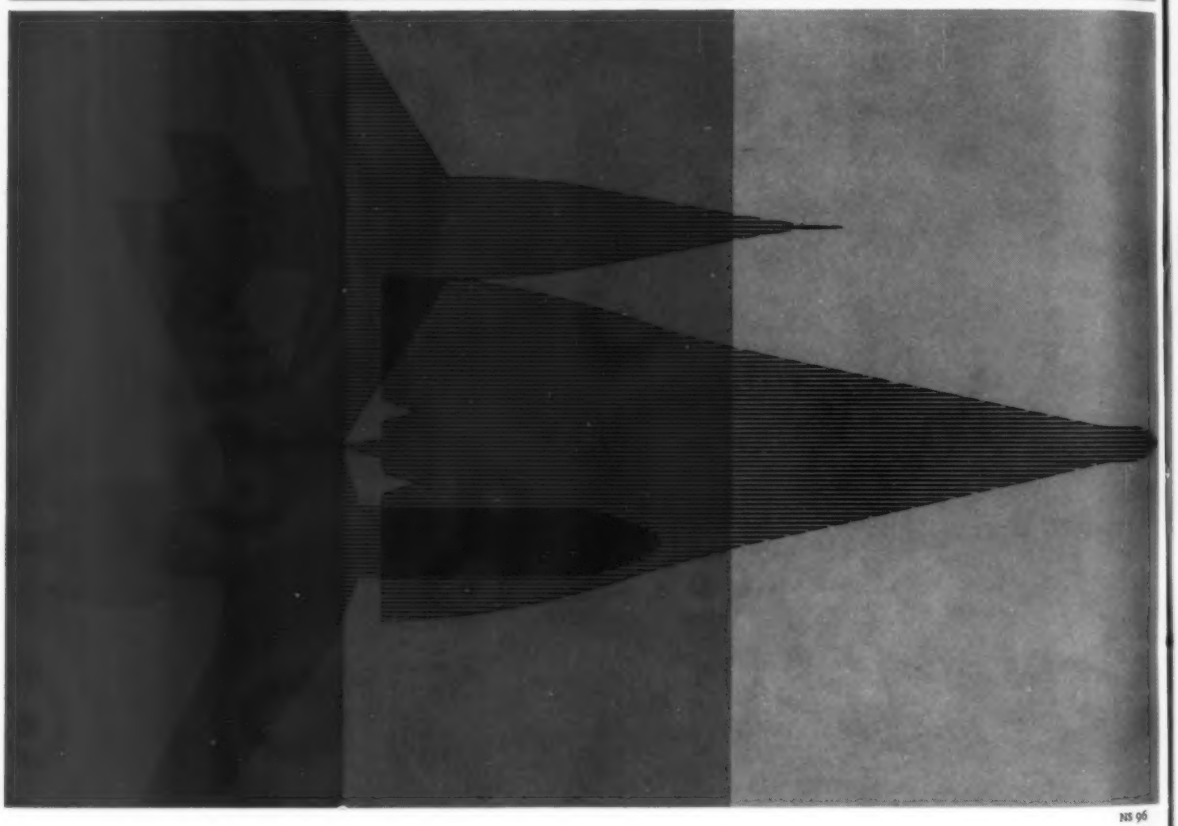

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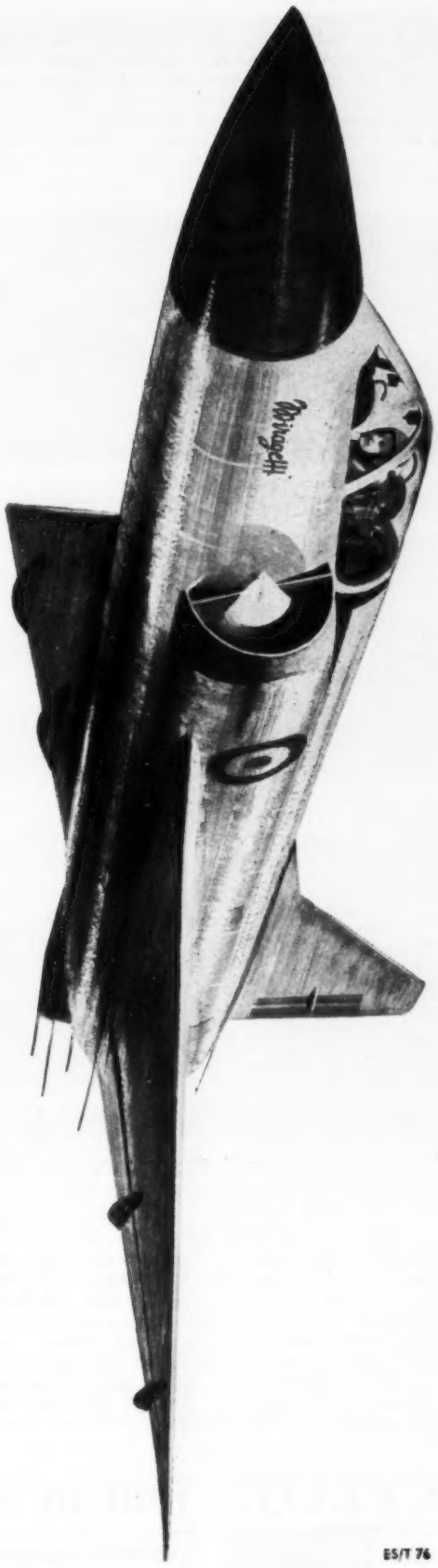
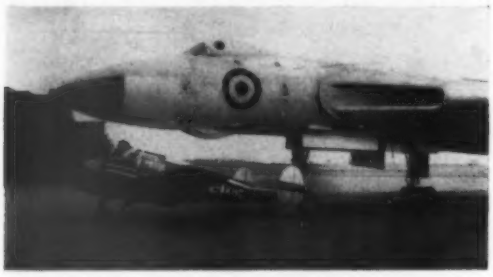


ES/T 76

A

AT the end of this year, *Flight* will be saying good-bye to G-AKHC—the Miles Gemini IIIA which, for the last seven tightly-packed years, has transported Iliffe executives, editorial staff and photographers to military and manufacturers' airfields in Britain and abroad. The Gemini is frequently seen at air shows and rallies all over Europe. Let's take one last valedictory look in the rear view mirror . . .

Photographer Ian Macdonald and *Autocar* Sports Editor Peter Garnier setting off from Croydon (dear old Croydon!) to cover a racing event on the Continent. Must have been '57.



July '58—and a Press visit to R.A.F. Waddington. The Gemini looks like a minicab under the nose of a Vulcan 1!

Flight staff with Polish pilot and guide at Warsaw airport when the Gemini visited Poland, the first British light aircraft to do so since 1939. The Gemini was flown out via Bremen, Copenhagen and Bornholm and back via Malmo, Bremen and Rotterdam. The flight was made after the Polish export organization invited *Flight* to come and see Polish light aircraft. The Gemini has been flown to France, Germany, Italy, Spain, Portugal, Holland, Belgium, Denmark, Sweden and Ireland.

. . . and it's a colourful exit as the album closes. Finished in light dove grey, blue, red, white and with flaps and fins in fluorescent blaze orange, G-AKHC has been not only a very familiar and ubiquitous aeroplane, but a more than usually comprehensive flying shade card for Cellon Aircraft Finishes. We shall miss it. We are consoled, however, by the increasing usage of Cellon finishes on business and executive aircraft generally. Why not check that they are specified on *your* new aircraft?

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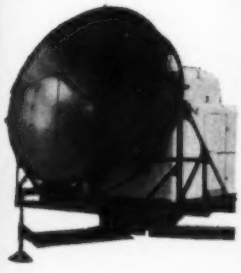

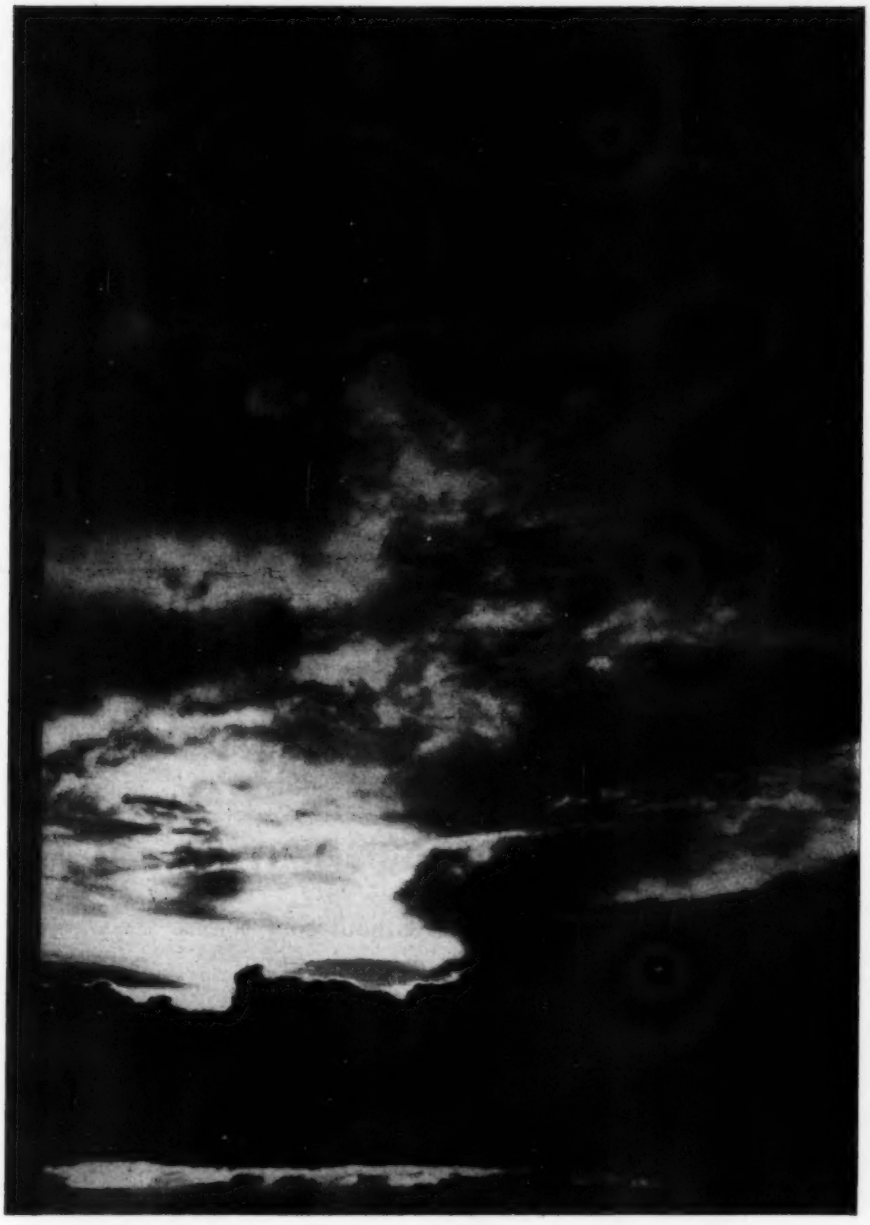

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Throughout the world, Decca Meteorological Radars are being used to provide essential data on weather and upper wind speeds. Such information enables flights to be planned and routes modified in order to avoid areas of precipitation and to make maximum use of favourable winds. The result is increased operating economy, passenger comfort and safety.

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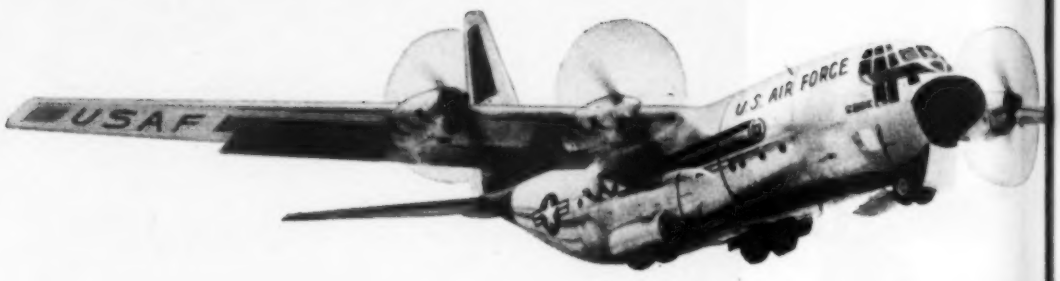

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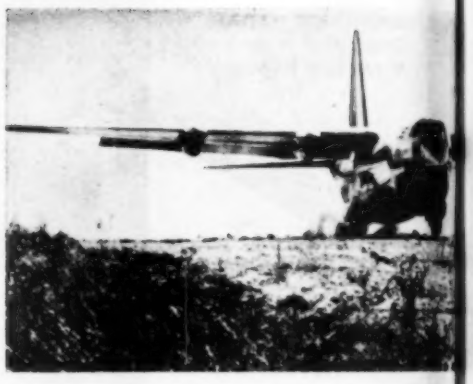

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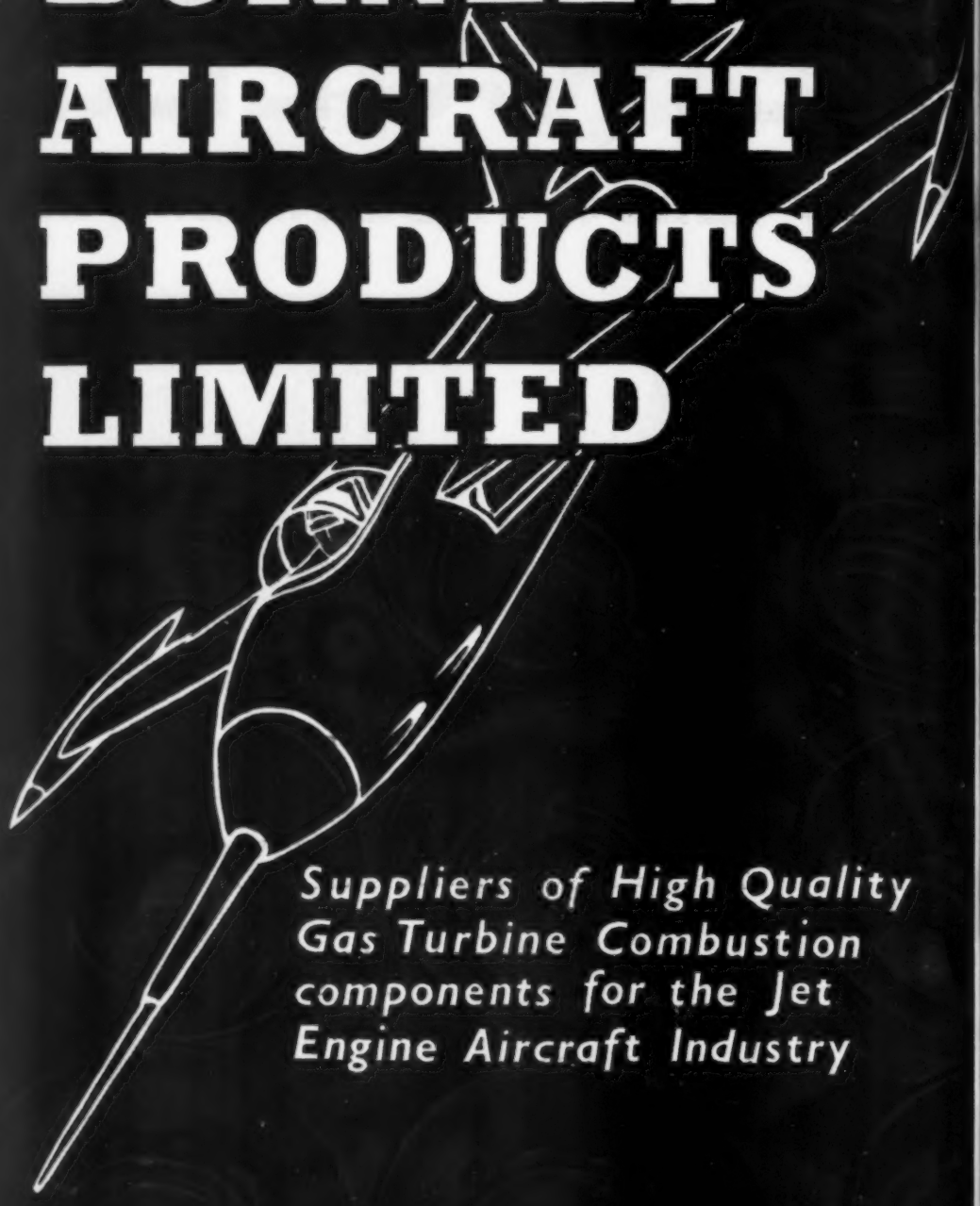

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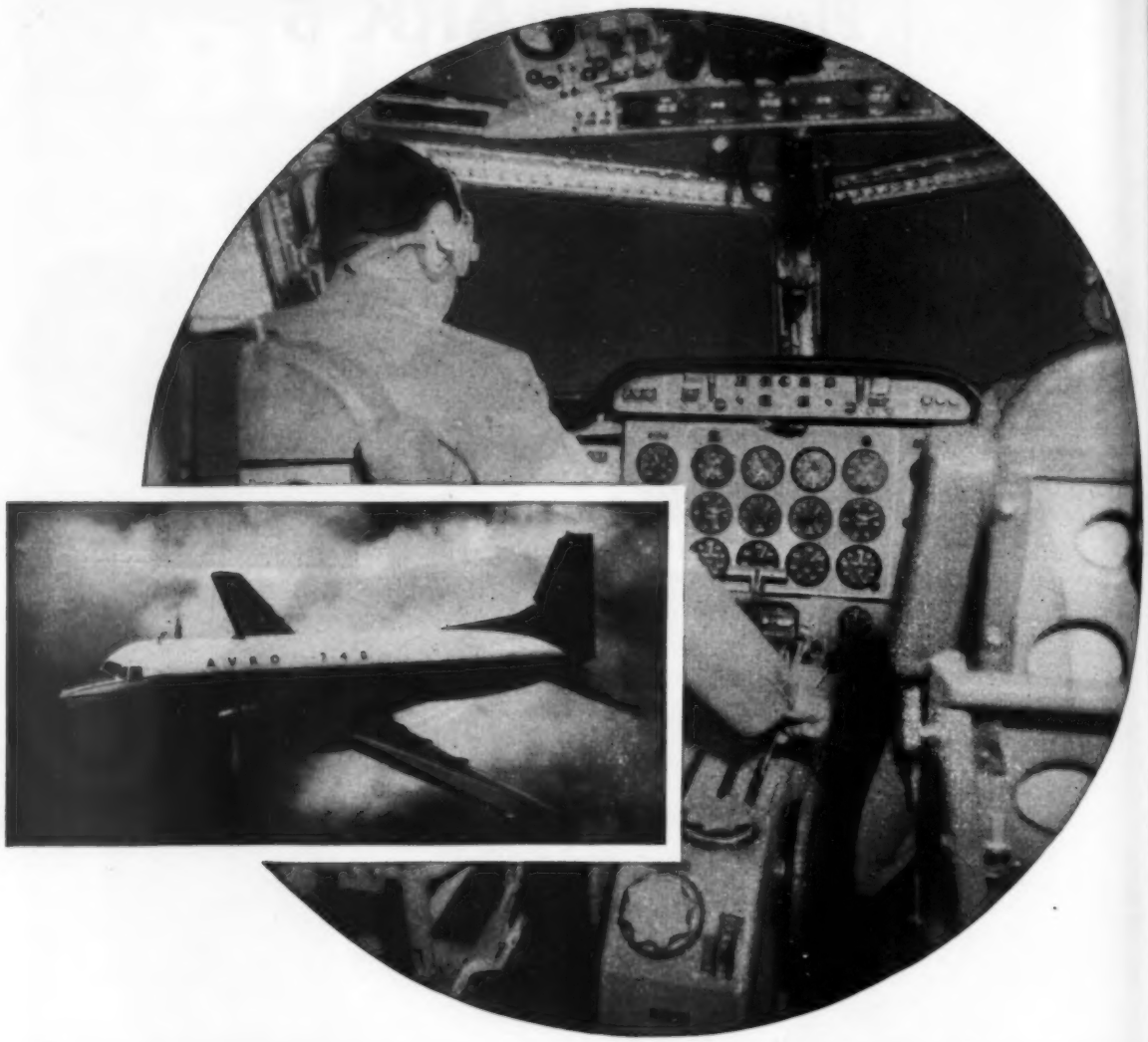

AVRO 748

flies into service soon

The Avro 748, powered by two Rolls-Royce Dart engines, has been ordered by leading airline operators in four continents.

HAWKER SIDDELEY AVIATION

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FLIGHT

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Full Astern on Q.3

AIR transport and nothing else has caused Cunard to "postpone"—which must surely mean cancel—its plans to build a *Queen Mary* replacement. It is astonishing that these plans got as far as they did. For years the shipping lines, like British Railways, have steamed contentedly along in the vague hope that air competition would never seriously threaten their existence. Even today there are people in the shipping industry who insist—though they have only to look at the figures to see otherwise—that sea traffic "is continuing to rise too." And British Railways, in their recent battles with BEA, gave the Air Transport Licensing Board the impression that they really have no idea of how their traffic is being affected by air competition.

Cunard's decision to go full astern on Q.3, and British Railways' head-on clashes with BEA, are reflections of an historic change in British transport—the transition of emphasis from the surface to the air. Obviously, the public interest demands some protection for the surface operators, and it is not easy to see how this can be achieved (Heaven forbid the re-creation of a Ministry of Transport and Civil Aviation). Perhaps these perplexed operators should seek to join what they cannot beat. Cunard bought Eagle Airways nineteen months ago; yet the shipping line now talks surprisingly of re-examining its investment in air transport. These are strange words to utter as an air transport subsidiary, with two jets on order and with all the political odds in its favour, awaits Government approval of its licence to operate across the North Atlantic.

There is also talk of Cunard being merged with P & O, which would bring Cunard Eagle and Silver City together. And there is City speculation about a marriage between Cunard and Furness Withy, which would bring Cunard Eagle and British United together. Whatever happens, Britain's shipping lines will be wise to retain their investment in air transport, while exploiting to the utmost the unique attractions and benefits of sea travel.

Reading Across

BRANIFF AIRWAYS' order for BAC One-Elevens, recorded in this issue, may well "read across" to other airlines. This is the expression used by Sir George Edwards, who is not easily carried away by sales successes, and who has a way of regarding both advancing and receding fortunes with the same cool eye.

The British Aircraft Corporation senses that it has a winner in the One-Eleven—an aeroplane of the same size as the Viscount, which burns the same amount of fuel while flying 200 m.p.h. faster. It is, simply, the sort of product for which many airlines seem to be looking. People want to come and talk about it—and this is subtly different from potential customers who agree, however politely, to listen to sales presentations.

Two or three times in the past, orders for new British aircraft, which seemed so firm and so encouraging at the time, have failed to materialize. An older and wiser industry can sense when it has a potential winner, even though it does not throw its hat high into the air or uncork the champagne when the export-sales breakthrough comes.

STERNJAEGER: Herr Strauss, German Defence Minister, climbs into the cockpit of the first German-built F-104G Super Starfighter after the handing-over ceremony at Messerschmitt's Manching works on October 16. The aircraft and the production programme were described in detail in "Flight" last week

FROM ALL QUARTERS

US Airline Orders One-Elevens

PLACING of a firm order for six BAC One-Elevens by Braniff Airlines, with an option on a further six, was announced last Friday. Braniff is thus the first major American operator to order a British—indeed, a foreign—airliner "off the drawing board." Details appear on page 670, and the order is also the subject of a leading article.

Needles in Orbit

THE controversial West Ford Project, involving a band of 350m copper microwave dipoles in orbit around the Earth at a height of more than 2,000 miles, became operational on October 21 with the launch of a USAF Midas satellite by Atlas-Agena vehicle from Point Arguello, California. Developed by the Lincoln Laboratory of Massachusetts Institute of Technology for the US Air Force, the experiment was designed to establish an "artificial ionosphere" five miles wide and 25 miles deep from which radio transmissions might be reflected. Opposition to the scheme (described fully in *Flight* of August 24, 1961) was voiced by scientists in a number of countries. Initial orbital period of the satellite from which the dipoles were dispensed was 170min, indicating an orbital height of some 2,350 miles.

Spearpoint Support

IN Northern Germany last week the land-air manœuvres held under the code-name Exercise Spearpoint were used as a trial for a new type of inter-Service control organization for offensive air support. Senior officers of both Army and RAF considered this had been an almost unqualified success, Army officers speaking highly of the support given by 38 Group, RAF Transport Command. The group, which with aircraft of 2nd ATAF provided air support, brought with them from Odiham a number of Westland Belvederes, which were making their first operational appearance outside Britain.

Decca and Eurocontrol

DURING a demonstration of the Mk 3 Self-setting Flight Log and Omnitrac computer at Gatwick last Monday, the Decca Navigator Co Ltd released the following statement:—

"The Eurocontrol Organization has announced its decision to evaluate the Harco system, a low-frequency hyperbolic navigation aid. Eurocontrol recently stated that 'although VOR supplemented by DME will have to be used during the coming years, it will be necessary to introduce a new, or improved, navigational aid system.' It subsequently issued a provisional operational specification for such a navigation aid, which was circulated to all the major electronic companies in Europe.

"The Decca Navigator Company, in collaboration with C.S.F. of France and Telefunken of Germany, submitted a joint proposal to meet the Eurocontrol requirement. The new system is called Harco (Hyperbolic ARea COverage), and its development is being carried out jointly by these three companies. The co-operation is also being secured of a well-known American company. The evaluation will be started early in the new year, will require the modifications of a Decca ground chain to convert it to Harco specification, and will include a comprehensive flying programme."

Breguet Atlantic Flies

FIRST flight of the Breguet 1150 Atlantic was made from Toulouse last Saturday. The company announced that the aircraft gave "full satisfaction" on its 42min test flight. Intended as a long-range ocean patroller for NATO countries, the Atlantic is powered by Rolls-Royce Tyne turboprops driving de Havilland propellers. It is due to enter service in 1963.

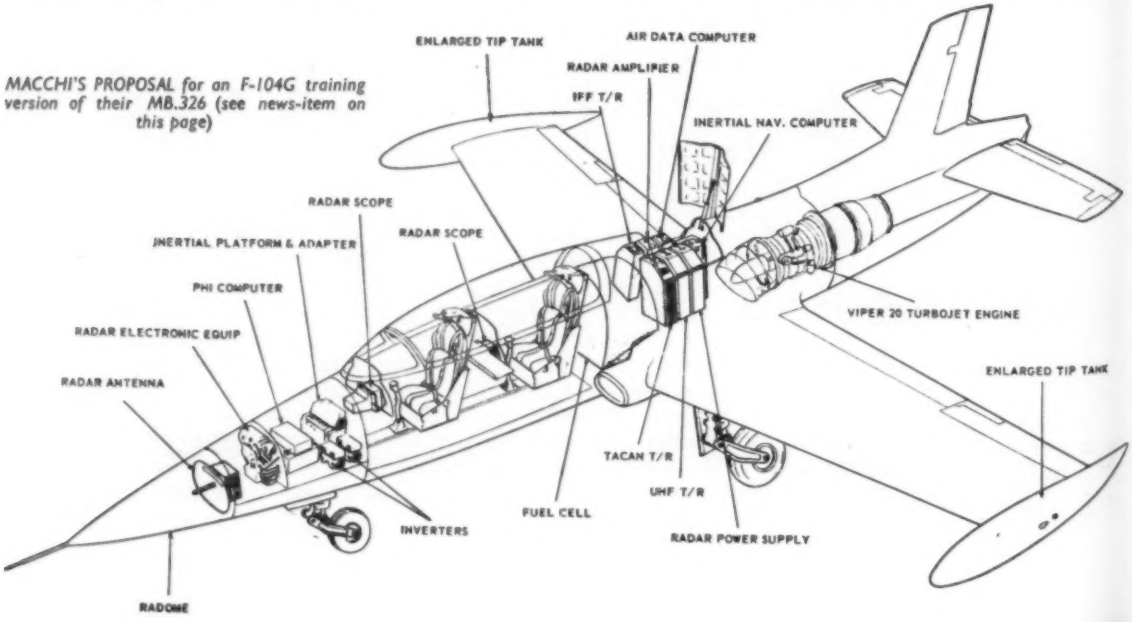
Changes at the Top

THREE changes in top posts have been announced by Air Ministry: Air Chief Marshal Sir Edmund Hudleston, KCB, CBE, is to be AOC-in-C Transport Command from March next year; he will be succeeded by Air Marshal Sir Wallace Kyle, KCB, CBE, DSO, DFC, ADC, as Vice-Chief of the Air Staff from next February; and Sir Wallace's present appointment as AOC-in-C Technical Training Command is being taken over from February 1962 by Air Marshal Sir Alfred Earle, KBE, CBE.

Another Trainer for the F-104G

MACCHI have now followed Fiat with a proposal to convert their existing trainer to carry the navigation and radio systems of the F-104G, in order to provide preliminary navigation training for future F-104G pilots. In an MB.326C version of the trainer now being produced for the Italian Air Force, Macchi propose to install the F-104G Nasarr radar and pitot-static boom in a nose extended by 8ft. Also fitted will be the IN-3-2A inertial system, ARC-66 UHF communications radio, ARN-52 Tacan, APX-35 IFF, air

MACCHI'S PROPOSAL for an F-104G training version of their MB.326 (see news-item on this page)



data computer and Position and Homing Indicator, arranged in the same battery of plug-in boxes as in the F-104G. Radar scopes will be provided in either front or rear cockpits and some radio controls will be duplicated. Fuel capacity displaced from the centre fuselage will be accommodated in enlarged tip-tanks. The Bristol Siddeley Viper 20 is offered as an alternative to the Viper 11 of the standard trainer. Macchi claim that the 326C offers by far the cheapest trainer for the F-104G and that it could be prepared for production in a very short time.

Leading particulars for the 326C with Viper 20 (3,000lb thrust) are as follows (figures in parenthesis refer to the standard trainer):—

Span, 34.8ft (32.9ft); length, 43.1ft (35ft); wing area, 204.5 sq ft (204.5 sq ft); empty weight, 5,225lb (4,930lb); electronic equipment, 755lb (155lb); useful load, 2,990lb (2,390lb); gross weight, 8,215lb (7,320lb); wing loading, 40.1lb/sq ft (35.8lb/sq ft); power loading, 2.74lb/lb thrust (2.92lb/lb thrust); max t.a.s. at 20,000ft, 455kt (435kt); stalling speed, 82kt (74kt); rate of climb, 4,800ft/min (4,420ft/min); service ceiling, 47,000ft (44,000ft); range at 36,000ft, 635 n.m. (600 n.m.); endurance, 2hr 10min (2hr 5min); take-off to 50ft, 2,100ft (2,070ft); landing from 50ft, 2,130ft (2,130ft).

Buccaneer Squadrons

NUMBERS of the first two Blackburn Buccaneer squadrons in the Royal Navy, 801 and 809, were announced by the Admiralty last week. They are being formed at RNAS Lossiemouth next March; one will be embarked in HMS *Ark Royal* and the other will probably be shore-based for a time.

New Soviet Helicopters

TASS, the Russian news agency, reports that new helicopters, designated V-2 and V-8, have appeared from the design office headed by Mikail Mil; their prototypes are the widely used Mi-1 and Mi-4. The V-2, which has "two light gas turbine engines," can carry up to eight passengers and two-and-a-half-times the weight of cargo lifted by the Mi-1. The V-8 can lift more than 20 passengers and up to two tons of cargo. It is believed that it will not be difficult to start series production of the new helicopters, as many of their components are identical with those of the Mi-4 and Mi-1. The new machines are described by Col-Gen of Aviation Yevgeni Loginov as "an important stage in the development of Soviet helicopter building."

Executive Jet from Spain

YET another executive jet aircraft is now in the design stage. It is the Hispano HA-56 project which will later be designated HA-230. Powered by two Turboméca 1,540lb-thrust by-pass turbojets mounted close beside the fuselage, it will seat six in a pressurized cabin and have the wings, tail unit, tip-tanks and undercarriage of the HA-200 Saeta jet trainer. The cabin will be pressurized to 9,000ft and have a stand-by oxygen system, dual controls and full radio. The nose torsion box of the single spar wing will form an integral fuel tank, supplemented by the tip-tanks. Both 28V d.c. and 115V a.c. electrical supplies will be provided and flaps, undercarriage and air brakes will be hydraulically actuated. De-icing for wings and engine intakes is being considered. The mock-up bears the inscription Hispano Messerschmitt, although no mention of the German company is made in the news release. The turbojets are apparently the same as those specified for the Saab 105 trainer. Dimensions and estimated performance are as follows:—

Span, 36.65ft; length, 31.65ft; wing area, 195.8 sq ft; empty weight, 3,858lb; useful load, 4,518lb; gross weight, 8,378lb; landing weight, 6,614lb; fuel capacity, 500 US gal. Mean cruising speed at 29,527ft, over 420 m.p.h.; landing speed, 100 m.p.h.; time to 29,527ft, 16.1min; range at 29,527ft, 1,600 miles; take-off run, 2,200ft; landing run, 1,660ft.

GROUND RADOME, for the protection of defence radar, completed and erected for test by English Electric at Freckleton, Lancs. Nearly 70ft in diameter and over 50ft high, it is made of reinforced plastics materials and consists of some 300 fabricated panels bolted together. Similar to the type of radome used on the American DEWline, it is designed to withstand hurricane winds and below-zero temperatures

Drive-Yourself Helicopters

A NEW company under the title Rent-a-Copters Ltd has been formed to provide daily, weekly or monthly "self-drive" helicopter-hire service in Britain. Rent-a-Copters can provide a pilot, but conversion courses for firms' staff pilots can also be arranged. The fleet consists of Hiller 12C three-seaters cruising at 70 m.p.h. for 150 miles and fitted with heaters. Later, the Hiller 12E/4 four-seater cruising at 95 m.p.h. will also become available.

The Rent-a-Copter office is at 2 Lowndes Street, London SW1 (telephone BELgravia 6477). Managing director is Mr Ken Riddy, and Mr R. H. Osborn and Mr J. Ward are respectively chief pilot and chief engineer.

Scottish Hovercraft Company

A SUBSIDIARY, Denny Hovercraft Ltd, has been set up by William Denny and Brothers, the Dumbarton shipbuilders, to build hovercraft at the company's Leven shipyard; four 50-seaters are planned. Officially, the new craft will be boats, and the subsidiary has applied for membership of the Scottish Ship and Boat Building Employers' Association.

IN BRIEF

We record with regret that Lady Cobham, wife of Sir Alan Cobham, died last Thursday at her home in Bournemouth, at the age of 64. She and Sir Alan were married in 1922. *Flight* hopes shortly to publish an appreciation showing how valuable a part Lady Cobham played in her husband's achievements.

Launches of the first Saturn booster and the second Ranger spacecraft were postponed at Cape Canaveral last week.

A 94lb P-21 payload designed to explore physical phenomena in the upper ionosphere was successfully launched to a height of 4,261 miles by the seventh of NASA's Scout development vehicles from Wallops Island, Virginia, on October 19.

New conditions for the use of London Airport by non-scheduled commercial, executive and private aircraft, introduced by Notam 437/61 for a trial period of three months (*Flight*, June 29) are to remain in force until further notice.

At a reunion in London last Tuesday, organized by Air Cdre G. B. Dacre, CBE, DSO, for his Service friends—some of whom, like himself, have held a flying licence for 50 years or more—there were to be among the guests AVM A. E. ("Biffy") Borton, CBE, CMG, DSO, AFC, Vice-Admiral R. B. Davis, VC, PC, CB, DSO, Air Cdre A. G. Broad, CMG, DSO, Lt Col L'Estrange Malone, FRAeS, GP Capt H. A. Williamson, CMG, and Maj H. A. Petre, DSO, MC.

A new company, FieldTech Ltd, has been formed within the Hunting Light Engineering Group, with the object of expanding the technical sales and consultant activities at present performed by the ancillary division of Field Aircraft Services at London Airport. The division act as UK distributors for the majority of the aeronautical and scientific products of Bendix Corporation and also a large number of products of Leach Corporation of California. In addition, exclusive European representation is held on behalf of Electronic Equipment Engineering Ltd, of Dallas. Mr M. D. Newman, previously sales manager of the ancillary division, has been appointed general manager of FieldTech and elected to the board. The other directors are Messrs J. L. Smith, E. H. Baker, D. G. Lee and C. P. Dollimore.

The Indian Navy aircraft carrier *Vikrant* left France for Bombay recently after manœuvres in the Mediterranean with the first of its Breguet Alizé (R-R Dart-powered) anti-submarine aircraft aboard.

A new Director-General of Engineering has been appointed at Air Ministry, AVM M. E. M. Perkins, CBE, succeeding AVM G. Silyn-Roberts, CBE, AFC, who is leaving the RAF.

London Aero Club, sole UK distributor for the Morane Rallye, expects to receive its first demonstration aircraft next month. Selling price will be £2,450.

Air Chief Marshal Sir Thomas Pike, Chief of Air Staff, paid an official visit to the Royal Norwegian Air Force last week. He spoke at a dinner commemorating the twentieth anniversary of two RNAF squadrons formed in Britain in 1941-42.

An "open day" is being held at RAF Bicester at Oxfordshire next Sunday (October 29) by the "Windrushers" Gliding Club of the RAF Gliding and Soaring Association. The only charge to the public will be a small one for car parking.

Sir George Gardner, Controller of Aircraft, MoA, visited the Baginton, Whitley and Bitteswell factories of Whitworth Gloster Aircraft on Wednesday of last week. He was met on arrival at Baginton by Mr W. S. D. Lockwood, the company's managing director, and Mr C. Bayly, director and general manager. Accompanied by Mr M. B. Morgan, Deputy Controller of Research and Development, and Dr M. H. L. Waters, technical assistant to the Deputy Controller, Sir George saw aircraft and missile research facilities and production lines and was given details of Argosy LOGAIR operation in the USA and military Argosy developments.

Missiles and Spaceflight

Spaceflight in Manhattan

By KENNETH OWEN

AMERICAN ROCKET SOCIETY'S CROWDED WEEK

ASTRONAUTICS came down to earth on October 9, and landed in New York. A Mercury capsule in Times Square got people interested. Another Mercury capsule, perched on top of its tailored Redstone rocket, shared Columbus Circle with the statue of Christopher Columbus and made people stop and stare as they came up from the subway or strolled out of Central Park. On the other side of the Circle is the Coliseum building, and inside the Coliseum the diverse artefacts of the space-age civilization were really in command—Ranger spacecraft, Mercury spacecraft, Orbiting Astronomical Observatories, ion engines, rocket engines, heat-seared nosecones and strange new satellites. Bizarre shapes that are coming to be normal, they grabbed your attention by the lapels and shook it hard.

The American Rocket Society was reporting to America. On three floors of the Coliseum building the first "Space Flight Report to the Nation" exhibition was in progress, while on a fourth floor scientists and engineers were reporting to each other in up to six simultaneous sessions of technical papers throughout each day. This was the biggest show ever staged by the Society, the first to which (from 5 to 10 p.m. each evening) the public were being admitted; and, without a shadow of a doubt, it was indeed the best yet.

At the opening ceremony on Monday, October 9, Dr Wernher von Braun, chairman of the organizing committee for the meeting, spoke of astronautics, Congressman William Fitts Ryan of New York spoke of politics, and Dr Harold W. Ritchey, president of the Society, quickly declared the week-long exhibition and meeting officially open.

Delegates had the choice of attending lectures in no fewer than six broad subjects when the technical sessions began on the Monday morning. They were forced to choose between robot exploration, logistics and operational problems of very large booster systems, structures and materials, power sources for electric propulsion, nuclear rocket mission applications, and astrodynamics. Other topics were introduced later the same day—including instrumentation for manned space flights, current state-of-the-art of missile and space vehicle flight testing, electrostatic thrust generation, propulsion reactor operation problems and facilities—and in the evening panel discussions and films were presented on the evolution of US liquid-propellant rocket engines, continuing education, electric propulsion, and astrodynamics.

Left, artist's concept of solar monitor employing folding solar thermoelectric power supply (from paper "The Solar Monitor—a Nuclear Rocket Mission" by B. E. Thompson, J. H. Guill and H. Radd). Right, concept of a solar monitor spacecraft with a dual power supply (from same paper)

Large Boosters In this session the papers included the following contributions:—

Chauncey J. J. Hamlin Jr of North American Aviation explored the broad general logistic problems of a one-hundred-million-pound space vehicle—the title of his paper was *Will There Be 100,000,000lb Space Vehicles?*—and examined the various modes of transporting and launching such a vehicle. Concepts of manufacturing and proposed site locations for this manufacturing process were indicated, and the land-based launch facilities and handling techniques required were examined in detail. Mr Hamlin described an ocean launch facility and the way in which it might be operated.

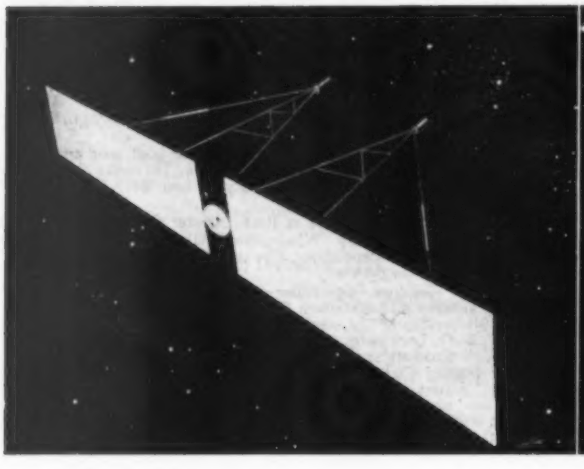
J. Hix and E. W. Bolster of Aerojet-General Corporation presented the results and conclusions of a study of the requirements associated with the transport, handling, checkout, assembly, and launch of extremely large solid boosters. The problems of fabricating solid segments of 140in diameter and above, and 100,000lb in weight, were discussed. Problems associated with larger segments up to 288in in diameter were reviewed, together with possible modes of transport. For both the land-launch and water-launch concepts, the site facilities involved were studied, in relation to expected sound level, access, storage, location and other factors.

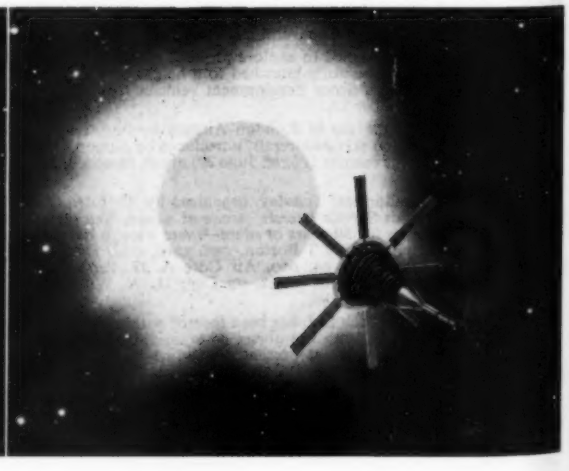
Edwin G. Johnsen of the Atomic Energy Commission discussed the test facilities required for the NASA/AEC nuclear rocket programme, and in particular the operational requirements which dictated the layout of the facility complex. The major operations which materially affected the layout were (1) the acquisition of test data, (2) normal hazards, (3) effects of the nuclear environment on test frequency and (4) accident effects. Mr Johnsen concluded by relating these requirements to proposed test facilities at the Nevada Test Site and at the Atlantic Missile Range.

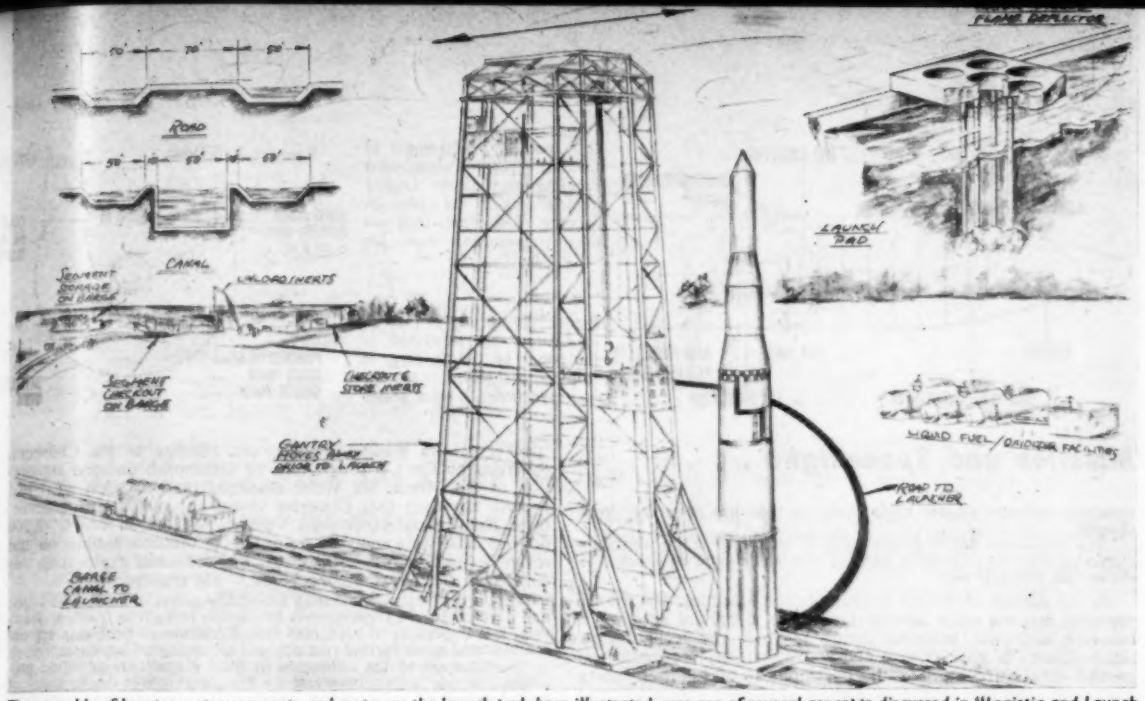
Nuclear Rockets This session was intended to present to the industry the capabilities envisaged for nuclear propulsion systems and specific mission applications of the rockets incorporating these engines. The papers included the following:—

The Nuclear Rocket Engine, Ideal Space Propulsion, by S. V. Gunn and A. Negro of Rocketdyne. A comparison of chemical and nuclear propulsion systems on the basis of cost, mission flexibility and reliability showed that the incorporation of a nuclear rocket engine into one or more upper stages of the currently planned Saturn or Nova systems was sufficiently attractive in terms of increased payload and decreased unit payload cost to make the development of the nuclear rocket engine desirable.

On the Attainment of Major Performance Increases with Solid-core Nuclear Rockets, by Jerry Grey and Donald L. Chubb of Princeton University. The specific impulse of solid-core nuclear rockets could be more than doubled by supersonic heat addition in the nozzle. The authors showed that such heat addition could easily be achieved in space missions without exceeding allowable core element temperatures, provided equilibrium dissociation were assumed. This heat addition was not achieved through atom recombination but through augmented turbulent heat transfer from a heat-generating solid.







The assembly of booster motor segments and motor on the launch pad, here illustrated, was one of several concepts discussed in "Logistic and Launch Requirements for Large Solid Boosters" by Hix and Bolster of Aerojet-General. This technique was stated to be more economical than clustering of pre-assembled motors on the pad, or transferring the completely assembled booster to the pad, provided the required launch rate was sufficiently low (preliminary estimates indicated approximately four weeks for booster build-up and checkout)

Optimization of Nuclear Rockets for Interplanetary Missions by Paul G. Johnson and Glenn R. Cowgill of NASA Lewis Research Center. This study of design-point powerplant parameters for nuclear rockets took into account the interacting characteristics of many components. Payload at destination was the optimization measure. The authors presented a method for determining optimum powerplant parameters and the results of one such analysis.

RITA, the Reusable Interplanetary Transport Approach to Space Travel by Raymon W. Hallet Jr, Willard E. Matheson and Robert F. Trapp of Douglas Aircraft Co. In this paper the authors presented a plan for the development of a nuclear rocket propelled space transport system. Economics dictated that the vehicle used in such a system must be reusable, and this requirement led to a single stage or, at the most, a two-stage device with both stages recoverable. The configuration should be versatile so that the vehicle could perform several worthwhile space missions. The authors reviewed the ability of conventional systems to satisfy these requirements and described the vehicles, performance, recovery and safety of the nuclear system.

Solar Monitor—a Nuclear Rocket Mission by B. Thompson, J. H. Guill and H. Radd of General Dynamics/Astronautics. The investigation of launch vehicles using nuclear upper stages had indicated that significant payloads could be delivered to within reasonable proximity of the Sun. This future payload capability would allow for extended observation and statistical analysis of important solar physical phenomena. As well as providing a higher-intensity source and greater angular resolution for spectrographic solar astronomy, important optical indices of solar activity on the temporarily hidden portions of the Sun could be monitored and transmitted to observers on Earth. This would be particularly valuable in attempting to define periods of relatively safe manned space-operations from conditions on the Sun.

Liquid-propellant Engines

At a luncheon meeting on Monday Dr William Pickering, director of the Jet Propulsion Laboratory and president-elect of the American Rocket Society, spoke on *Space Professional Societies and the National Interests*. The ARS Propulsion Award for 1961 was presented to Robert B. Young, vice-president of Aerojet-General Corporation and manager of the firm's liquid rocket plant at Sacramento, California, for his "outstanding contributions in the field of liquid rocketry in the United States."

Among the evening sessions, that devoted to the evolution of US liquid-propellant rocket engines was a particularly interesting event. Review papers, films and exhibits were presented by seven speakers, after which a panel discussion was held on the subject of future developments.

Under the chairmanship of Robert C. Truax of Aerojet-General, the following main subjects were covered: Chronology of American liquid-propellant rocket development, George S. James, Aerojet-General; pre-World War 2 rocket development, G. E. Pendray; assisted take-off and engines for manned rocket aircraft, C. W. Schnare, Edwards AFB; rocket engines for tactical military missiles, A. Sherman, Reaction Motors Division of Thiokol; engines for ICBMs and IRBMs, S. K. Hoffman, Rocketdyne; rocket engines for upper-air research vehicles and stages of space-research vehicles, Seba Eldridge, Space-General Corporation; and post-ICBM rocket engines, R. B. Canright, NASA.

Contributions made by Prof James Van Allen and Mr Arnold Frutkin on Tuesday, October 10, were reported in last week's issue*. The subject-headings of the technical sessions on this day comprised human factors and bio-astronautics, missiles and space vehicles, power systems, electrothermal and electromagnetic thrust generation, nuclear instrumentation, hypersonic heat transfer and vaporization ablation, the Discoverer and Advent satellites, electric propulsion testing, current communications satellite programmes, hypersonics, space law and sociology, and technical information.

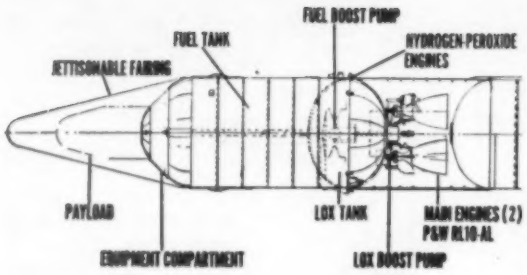
Among the papers of more general interest were *Vehicle Recovery and Re-use* by Robert Gay Voss of NASA's Marshall Space Flight Center; *Advanced Manned Space Systems* by Maxwell W. Hunter and Eugene B. Konecci of Douglas Aircraft Co; *The Discoverer* by James Plummer of Lockheed Missiles and Space Co and Col C. L. Battle of the USAF Satellite Systems Division; *The Advent Communication Satellite Program* by George E. Mueller of Space Technology Laboratories and Brig-Gen William M. Thames of the US Army Advent Management Agency; *Current Developments by the Department of Defense in the Communications Satellite Field* by Ralph Clark of the Department of Defense, and *Current Developments by the National Aeronautics and Space Administration in the Communications Satellite Field* by Daniel G. Mazur of NASA's Goddard Space Flight Center.

Estimated costs involved in the recovery for re-use of a two-stage vehicle of the Saturn class were given in the paper by Voss. His assumptions included a ten-vehicle research and development programme costing $1,256m, and a recovery-system development programme costing a further $25m. The relative unit costs for expendable and recovered vehicles clearly depended on the number of firings expected per year, but the author concluded that "recovery is clearly attractive if the combined cost of the recovery operation and refurbishment can be held to less than 55 per cent of the cost of a new booster." Mr Voss continued:—

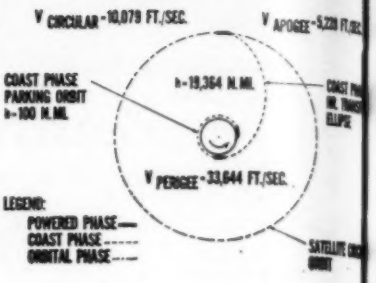
"There are two recovery systems that are now being seriously considered for application to the Saturn system—the Rogallo or paraglider wing, and the parachute recovery. The Rogallo wing has its limitations in glide range. It appears at this time that the booster-wing combination with presently planned burn-out conditions would be unable to return to Cape Canaveral or to reach one of the downrange islands without supplemental power or a tow aircraft. On the other hand, parachute recovery would result in immersion of the booster in salt water; and one would intuitively expect the corrosive effect of salt water to result in higher refurbishment rates. But this is not necessarily the case.

"Tests conducted by Marshall Space Flight Center on an H-1 rocket engine indicate that, after immersion in salt water, only minor refurbishment is required. In the two tests conducted to date the refurbishment required on the engines was approximately four per cent of the cost of a new engine. The tests were designed to simulate the environment that the engine would experience during a recovery operation, and no coatings or preservatives were applied to the engine previous to its immersion. These results, preliminary though they may be, make

**Inadvertently presented as part of the report of the IAF Congress in Washington.*



Left, general arrangement of Centaur, from "Development Progress on Centaur Launch Vehicle" by Lt-Col John D. Seaberg. Propellants used are liquid hydrogen and lox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Right, the primary mission of Centaur, as described in the paper by Col Seaberg, is to place a satellite in the 24-hour synchronous orbit shown

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parachute recovery appear more attractive than has previously been thought . . .

"The conclusion drawn in this study is that recovery is definitely attractive from the economics point of view and should be initiated at the earliest practical date."

On the subject of NASA communication satellites, Mr Mazur reported that the space administration was at present adopting a two-fold approach, pursuing jointly research and technological developments in both passive and active systems. Research into passive satellites comprised the development of rigidized-sphere techniques, the engineering of balloon container separation and proper balloon inflation, and the development of deployment techniques for equal orbital spacing of passive satellites. The administration's passive satellite flight programmes are as follows:—

(1) Ballistic launches of 135ft diameter rigidized spheres with television and recoverable camera coverage of container separation and initial balloon inflation (AVT launches).

(2) A low-altitude orbital launch to test lifetime, rough sphericity and effect of radiation pressure on the orbit (Project Echo A-12).

(3) An experiment to deploy three passive structures equally spaced in orbit to study fully lifetime, deployment techniques, and communications utility at the 1,500–1,700-mile altitude (Project Rebound).

NASA is in addition carrying out or sponsoring the following active repeater projects:—

(1) *Project Relay:* Low-altitude orbit (1,000–3,000 miles) by spin stabilized satellite. Two redundant transponders each providing one-way television and two-way telephony. Ground transmitter 10kW, frequency centred at 1,725 Mc/s, satellite frequency 4,170 Mc/s. Satellite output power ten watts with system using 85ft, 150°K noise temperature self-tracking antennas. Satellite contractor RCA; ground stations of A.T. and T., I.T. and T., and in Brazil, France, Germany, and Britain.

(2) *Project TSX:* In co-operation with A.T. and T., similar orbit to Relay, spin-stabilized satellite. Ground transmitter 2kW, frequency centred at 6,390 Mc/s. Satellite frequency 4,170 Mc/s with an output of about three watts with system using 30–50°K noise temperature, self-tracking antennas and use of masers and/or FM feedback receivers. One-way television and two-way telephony in a single transponder. Satellite contractor Bell Telephone Laboratories, ground stations as for Relay.

(3) *Project Syncom:* Narrow-band transponder in a 33° equatorial orbit. Ground transmitter frequency in the 8,000 Mc/s band. Spin-stabilized with simple gas jet period and attitude control. Satellite contractor Hughes Aircraft Co, special ground stations provided by the US Army Advent Management Agency.

Space Vehicles Discussed

One of several effective new ideas at the meeting was the series of three "interdisciplinary" spaceflight panel discussions organized by Dr Jerry Grey of Princeton University. With the respective subjects of the vehicles, the missions, and the global effects, the sessions were designed to give the various specialists attending the meeting a wider view of the whole spaceflight picture. The content of these discussions will be reported in future issues of *Flight*; for the present may we record merely that the first session was held on Wednesday, October 11, with the panel members listed in the following paragraph, and that all three sessions were extremely successful.

Under the chairmanship of Krafft Ehricke, Centaur programme director for General Dynamics/Astronautics, the members of the opening panel session each took one aspect of the overall subject. Willis M. Hawkins, vice-president and general manager of Lockheed Missiles and Space Co, was concerned with vehicle systems; Martin Summerfield, professor of aerospace propulsion at Princeton University, with chemical propulsion; R. W. Bussard of the nuclear propulsion division of Los Alamos Scientific Laboratory, with advanced propulsion; C. Stark Draper, head of the aeronautics and astronautics department of Massachusetts Institute of Technology, with guidance and control; Kurt H. Debus, director, launch operations directorate, Marshall Space Flight Center, with launch operations; and Norris F. Dow, of General Electric's Space Sciences Laboratory, with special vehicle problems.

The Administrator of NASA, Mr James E. Webb, was the speaker at the Wednesday luncheon meeting at the Coliseum. Referring to the US programme to accomplish manned exploration of the Moon, Mr Webb disclosed that, as soon as it had become apparent that Congress would approve the programme, three massive computer runs were carried out in which "2,200 discrete tasks were analysed using the performance evaluation and review technique to determine that manned lunar exploration was feasible in the ten-year time perod." He continued:—

"On the third run we found an acceptable course of immediate action and have initiated a large number of steps to bring it to fruition. However, it is important to recognize that a number of problems are unresolved and await further research and technological advance.

"With respect to the utilization of solid propellants or liquid propellants in our largest boosters, we are carrying out development of both for such period as is required to make the necessary evaluation.

"With respect to the possibility for our most advanced missions of building a large spaceship out of components placed in orbit around the Earth by medium-sized rockets, as against the advantages of using a giant-sized booster of the Nova class, we are proceeding with the necessary fact-finding. We are incorporating in our decisions on programs and facilities the flexibility that will permit us to take advantage of either these or other proposed methods for accomplishing our goal.

"We have not subordinated our work in space science to the man-in-space program, but have instead increased it as a necessary first step in all our programs.

"We have not reduced our program for research on scientific and technological programs associated with space which can be conducted here on Earth, but have rather increased it where this was the most efficient way to accomplish the desired result.

"We have not reduced our work in the areas of aeronautical research and the study of atmospheric flight, but have rather increased and extended it to determine every area in which gains for the space program as well as for manned flight in the atmosphere could be obtained.

"We have not instituted what is sometimes called a crash program, but have proceeded at a fast pace through the orderly processes of government, including Congressional examination. We have worked in close co-ordination with the Department of Defense, the Atomic Energy Commission, the State Department, the Federal Communications Commission, the Department of Commerce, the National Science Foundation and indeed all agencies with interest in participation.

"We have followed the policy of using existing resources of the nation in such outstanding organizations as the Air Force, the Army and Navy, the Weather Bureau, the Atomic Energy Commission, the National Bureau of Standards, and in universities and industry . . .

"In the build-up for our national launch-vehicle program, we have planned, financed and proceeded to procurement on the newer Saturn configurations to increase performance of the Saturn C-1, and have moved a long way towards fixing the configuration for Nova . . .

"Arrangements have been made to keep a Tiros weather satellite in orbit at all times until a follow-on system operated by the US Weather Bureau is brought into being. At the President's request Congress has appropriated funds for the Weather Bureau to initiate the Nimbus satellite meteorological network. . . .

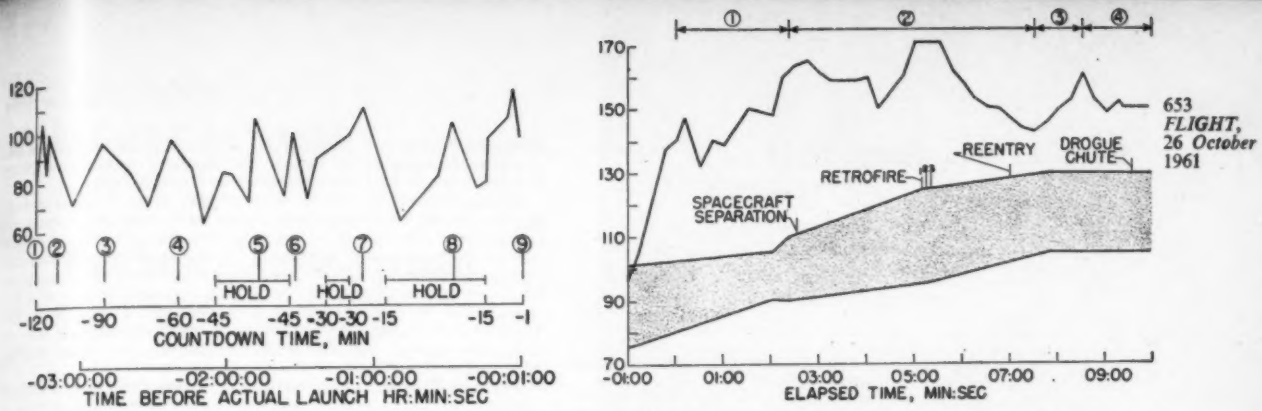
"Arrangements are now being considered to utilize Transit capabilities to meet the navigational requirements of commercial airplanes and ships . . ."

Environment of Space

Among the new technical-session subjects on Wednesday were the environment of space (beginning a series of papers which covered atmospheric structure, the ionosphere, aurora and airglow, solar radiation, dust and meteorites, geomagnetically trapped radiation, magnetic fields, cosmic rays and the interplanetary medium, the Moon, and the planets), electric propulsion missions, guidance and control, and new liquid-rocket techniques for space.

Papers included *The Manned Electric Rocket Challenge* by R. J. Hayes of NASA, M. A. Hoffman of MIT, and Ernst Stuhlinger of Marshall Space Flight Center; *Applications of Electric Propulsion to NASA Missions* by T. N. Edelbaum, H. S. London, W. R. Fimple and F. W. Gobetz of United Aircraft Corp; *Performance of Nuclear-Electric Propulsion Systems in Space Exploration* by E. W. Speiser of Jet Propulsion Laboratory; *Earth Satellite Missions for Electric Propulsion* by E. E. Dangle of Goddard Space Flight Center; *Injection Guidance* by R. J. Keeler and C. W. Benfield of Minneapolis-Honeywell; and *Space Guidance* by C. R. Gates, J. R. Scull, and K. S. Watkins of Jet Propulsion Laboratory.

In *The Manned Electric Rocket Challenge* the propulsion require-



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Pulse rate (beats per minute) of Capt Virgil Grissom during countdown and MR-4 flight, from "The Mercury-Redstone Program" by Jerome B. Hammack and Jack C. Heberlig of NASA. Left, 1, insertion begins; 2, purging suit; 3, ready for hatch closure; 4, hatch has bolt problem; 5, exercise; 6, clearing gantry; 7, squibs armed; 8, switch inverters; 9, launch. Right, 1, powered flight; 2, zero g; 3, re-entry; 4, descent

ments needed for electric rockets to transport men from low Earth orbits to the planets on a routine basis were analysed. Thirty-day trips to Venus and 50-day trips to Mars were considered, together with "such visionary missions as 200 days to Jupiter and two years to Neptune." Intermediate and slower flight-duration requirements were also included for possible unmanned cargo missions. The authors concluded that electric propulsion systems appeared capable of satisfying these ambitious requirements, provided that this new development were not overshadowed by concentration on the manned lunar landing programme.

The *Applications* paper by the four UAC authors contained an attempt to appraise the performance of first-generation electric propulsion systems for missions in 1965-70, and to estimate the performance improvements attainable with advanced systems in 1968-75. First-generation systems were considered to comprise spacecraft launched with Atlas-Centaur and using SNAP-8 power supplies in conjunction with arc-jets and ion rockets.

The authors indicated that the first-generation systems would be desirable for missions requiring large amounts of power for communications or other non-propulsive purposes. The second-generation systems would be desirable for many missions even when the power supply was not needed for other purposes. These later electric propulsion systems would be capable of carrying more payload in less time than would either nuclear or chemical rockets for most interplanetary missions.

In *Earth Satellite Missions* the Goddard authors considered the possible applications of arc-jet-propelled vehicles on Earth orbital, cislunar and lunar missions. Electric propulsion appeared useful in scientific satellites and operational satellite applications, they concluded, including television and weather satellites, lunar and solar observatories.

No new concepts are required to satisfy present needs for injection guidance or control for space missions, according to the paper by Keeler. Those already developed, tested and used include attitude control, radio guidance and inertial guidance systems, some designed for orbital or space missions and others carried over from the guidance and control of ballistic boosters. These guidance designs were developed for the injection portion of the space mission. For specific applications it might become desirable to consider the composite guidance problem for the mission, and it was only in this event that injection guidance might incorporate conceptual differences.

The injection guidance system established initial conditions for a spacecraft orbit. The orbit might be achieved as a result of a continuous application of thrust, or after two distinct periods of thrust separated by a coast period and a parking orbit. The parking orbit served to increase the tolerance to launch time and launch azimuth. The injection phase included both periods of thrust in the latter case. The initial conditions achieved must result in a specified velocity and position, and the time of cut-off thrust must be controlled to achieve the particular velocity on a more-than-transitory basis.

Of the three types of guidance systems, inertial guidance was the most promising. It provided significantly better performance than attitude control because it was a closed-loop system. Since it was self-contained it was not limited to line-of-sight trajectories, as was the case with radio guidance. Inertial systems with sufficient flexibility to handle the full scope of injection guidance requirements had been built and were in the early stages of testing.

The current state-of-the-art of post-injection guidance for unmanned lunar and planetary spacecraft was described in the *Space Guidance* paper by the three JPL authors. The target dispersion resulting from injection guidance errors might be reduced significantly, they indicated, by making one or more post-injection manœuvres. These manœuvres could be accomplished during a period of several hours to several days after injection, using a quantity of propellant of only one to two per cent of the spacecraft weight. Additional manœuvres carried out near to the target could reduce the dispersions still further so that it might be possible to accomplish close fly-bys, orbiters, or soft landings.

Techniques for accomplishing celestial and radio command mid-course guidance were considered in the paper, guidance systems for planetary approach and lunar soft landings were discussed, and a description was given of the spacecraft components required to mechanize post-injection guidance.

The panel discussion on Thursday, October 12, considered the subject of non-military missions, under the chairmanship of Arthur R. Kantrovitz, director of the Avco Everett Research Laboratory. Herbert Friedman, superintendent of the astrophysics and atmosphere division of the US Naval Research Laboratory, spoke on sounding rockets and scientific satellites; Dr William H. Pickering, director of the Jet Propulsion Laboratory, on exploration of the solar system by lunar and planetary probes; F. W. Reichelderfer, chief of the US Weather Bureau, on meteorological applications; John R. Pierce, director of research of Bell Telephone Laboratories, on communications applications; and Robert R. Gilruth, director of Project Mercury and of NASA's Space Task Group, on manned spaceflight.

Military Operations

The military interest in space was expressed forcibly in a speech at Thursday's luncheon meeting by Gen B. A. Schriever, Commander of the USAF Systems Command, who after mentioning the fact that Major Herman Titov of the Soviet Air Force had flown "within 150 miles of our nation's capitol," went on to declare his theme that, "As a military commander who shares the responsibility for the defence and security of this nation, I am convinced that we must be prepared to operate in space in order to preserve the peace." Gen Schriever continued:—

"Since 1957 the United States has placed 51 devices in orbit. The reliability we have demonstrated in placing devices in orbit has increased from 29 per cent during 1958 to 69 per cent so far in 1961. In the Discoverer experiments, both launching and recovery have become almost routine. Since February 1959 we have successfully placed 22 Discoverer payloads in orbit. Since August 1960 we have recovered eight capsules from orbit.

"The reliability of our strategic missiles, which presently provide most of our space boosters, is quite satisfactory now and it is still improving. For example, the Atlas flight reliability in firings supporting space investigation experiments is 77 per cent. The overall flight reliability of Thor has been above 90 per cent during the last 12 months. The last six Titan firings have all been successful. This good and growing reliability in our launching vehicles has gone generally unappreciated in an atmosphere of news headlines which sometimes emphasize our more spectacular failures . . .

"In carrying out our ICBM programmes we also have developed the capability to procure large modern systems which employ modern technology and, even more important, achieve reliable operational status with these systems after they have been delivered to the field. The experience gained in these programmes covers the whole spectrum of research, development, procurement, transition of the systems from technical specialists to operational units in the field, and logistic support throughout all phases of the programmes . . .

"What of our needs for the future? I am convinced that in order to operate effectively in space we will need a mix of unmanned and manned space vehicles . . .

"In order to transport, support and utilize man in space, we must develop the ability to place large payloads in space, the ability to navigate and manœuvre spacecraft, the ability to go into space and return to Earth at times and places chosen to support a selected mission and the ability to rendezvous in space and accomplish refuelling or cargo transfer.

"This will enable us to observe or inspect satellites and determine whether or not an unidentified satellite is hostile or friendly, just as we are able to identify unknown aircraft today. Should a satellite be determined to be hostile, we must be able to neutralize it. If we cannot deal with such satellites, it is doubtful that our nation can continue to preserve its essential values . . .

"The key to rapid utilization of space by man for military purposes is flexibility. We must not design our space vehicles and programmes just to achieve those objectives which we can define now. We must design the vehicles with enough capacity to rapidly adapt to or incorporate the vast new knowledge which will flow from our space programme. A manned space observatory should be designed so that the composition

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of the crew of observers can be modified or completely changed to accomplish new or additional missions. Such an observatory should have provisions for the addition or replacement of equipment simply and quickly in order to respond to new knowledge or new requirements.

"This then is what we need but, if we are going to achieve our national goals in time, we may have to re-think our traditional approach to the use of technology. Historically, we have tended to over-estimate what we could do on a short-term basis, and to under-estimate grossly what we could do on a long-term basis. As a result, the United States has been notably slow to recognize the military application of new inventions. . .

"As we move into an expanded national space programme, we need to take seriously the lessons of the past. In the past, our space efforts have been carried out under an unnecessary, self-imposed restriction—namely, the artificial division between space for peaceful purposes and space for military uses. But there is very little technical distinction between the two. The same hardware and techniques used to launch an orbiting scientific capsule can also be used to orbit an early-warning satellite. The same techniques that can send a man into space as a scientific observer may also send him there in a military role . . .

"The accomplishment of the manned lunar landing programme and the development of manned military space systems are both of vital importance to the prestige and I believe to the ultimate survival of this nation and the rest of the Free World.

"I am sure that the key to our success will be management . . . I feel certain that the United States can become first in space during the years ahead. The scientific, industrial and military space resources are available to do the job. Technology will *not* be the pacing factor. Success will depend on the ingenuity with which the available resources are managed . . .

"It must also be realized that there is no inherent difference between basic military and non-military space technology. What matters is not the technology but the intent. Our intentions as a nation are peaceful and are known to be so. We should not be inhibited in developing whatever systems are needed for our legitimate self-defence—and in giving them proper priority . . ."

The ARS James H. Wylde Award was presented at the luncheon to Harrison A. Storms, president of the Space and Information Systems Division of North American Aviation, for "his outstanding leadership and distinguished engineering and administrative contributions to the X-15 programme, constituting a major step in advancing the application of rocket power to manned space flight."

Technical sessions during the day were devoted to subjects which included future communication satellite systems, advanced guidance devices, design of electric propulsion spacecraft, NASA programme report, and space propulsion and components. Among the papers presented were *Development Progress on Centaur Launch Vehicle* by Lt-Col John D. Seaberg of the Marshall Space Flight Center, *The Role of Project Ranger in the NASA Lunar Program* by Oran W. Nicks of NASA Headquarters: *Development Report on Saturn* by Konrad K. Dannenberg of the Marshall Center, *The Mercury-Redstone Program* by Jerome B. Hammack and Jack C. Heberlig of the Space Task Group, *Policy Problems of Communication Satellites* by Rep George P. Miller, chairman of the House Committee on Science and Astronautics, and *The Systematic Development of Satellite Communication Systems* by Kenneth G. K. McKay of Bell Telephone Laboratories.

Communication Satellite Policy

Included in Representative Miller's paper was a review of the eight policy statements made by President Kennedy on the subject of the ownership and operation of a communication satellite system. These were: (1) new and expanded international communication services were to be made available at the earliest practicable date; (2) the system was to be global in coverage, including service where individual portions of the coverage were not profitable; (3) opportunities for foreign participation were to be provided through ownership or otherwise; (4) non-discriminatory use of and equitable access to the system by present and future authorized communication carriers was to be assured; (5) there was to be effective competition such as competitive bidding in the acquisition of equipment; (6) ownership or control should assure maximum possible competition; (7) there was to be full compliance with anti-trust laws and regulatory controls; and (8) an economical system was to be developed, the benefits of which would be reflected in overseas communication rates.

Included in the space propulsion session were the papers *Status and Trends of Solid Propellants for Space Vehicle Systems* by T. E. Myers and S. C. Britton of Rocketdyne, and *Spherical Rockets for Space Vehicle Attitude and Velocity Control* by John E. Roach and R. J. Seymour of Thiokol Chemical Corp.

The subject *The US and USSR Space Programs: a Critical Evaluation* was guaranteed to generate considerable interest—which it indeed did at the public panel-discussion held on Thursday evening. A panel comprising Hugh L. Dryden of NASA, Arthur Kantrowitz of Avco, F. J. Krieger of the Rand Corporation, Wernher von Braun of NASA, and Gen Schriever answered questions devised and presented by chairman Arthur Clarke, who, as a past chairman of the British Interplanetary Society now living in Ceylon, could fairly be considered an interested neutral.

Friday, October 13, was far from unlucky as far as those attending the meeting were concerned, for the day's programme included (in addition to the continued specialist sessions) the third spaceflight report panel discussion, devoted to the global effects; a thoughtful luncheon speech in which Dr Simon Ramo put forward a suggestion for a new and more-efficient relationship between industry and the government on development programmes; and a banquet at the Waldorf-Astoria Hotel in the evening at which the guest of honour and main speaker was the Vice-President of the United States, Mr Lyndon B. Johnson.

The Vice-President, after calling on all members of the United Nations "to join in a major effort to establish a far-ranging rule of law for outer space," said that the United States must accelerate and improve seven factors in the national space programme. These were (1) development and production of larger and more reliable rocket engines, both chemical (liquid and solid) and nuclear; (2) planning and activation of rendezvous techniques; (3) exploitation of US space knowledge in communication, navigation and meteorology; (4) progress in the life sciences; (5) efforts "to improve the quality of private industry's production and Government's planning and direction"; (6) attempts "to co-ordinate intra-governmental activities and to marshal all skills in the national programme"; and (7) programmes "to inform the peoples of our own country and the rest of the world of the accomplishments and the necessities of space exploration."

Dr Ramo's main thesis was that highly qualified engineers tended to spend more effort on government contract proposals than in carrying out the actual job. Measured performance rather than paper proposals, he suggested, should be the criterion for the award of contracts.

Panel and Specialist Sessions

Members of the global-effects panel comprised Trevor Gardner of Hycon Manufacturing Co (military effects), Oskar Morgenstern of Princeton University (political effects), Donald Mitchell of General Telephone and Electronics Corporation (industrial economic effects), Tunis A. M. Craven of the Federal Communications Commission (international co-operation) and Philip Morrison of Cornell University (extra-terrestrial contact), with James H. Doolittle of Space Technology Laboratories as chairman.

In sessions concerned with propulsion system selection, environment of space, propellant technology, magneto-fluid mechanics, space law and sociology, and post-injection guidance, Friday's papers included *Liquid and Solid Stages for a Manned Lunar Landing Vehicle* by Elliot Mitchell, A. O. Tischler and William Cohen of NASA; *Reliability—Propulsion and Launch Vehicles* by Landis S. Gephart of NASA; *Application of Cryogenic Propellants for Space Flight* by Paul R. Vogt of Rocketdyne; *Application of Storable Propellants for Space Flight* by Scott B. Kilner and Louis R. Rapp of Aerojet-General; *Political Science and Outer Space* by Eilene Galloway of the Senate Committee on Aeronautical and Space Sciences; and *Guidance and Navigation Systems for Lunar Missions* by R. C. Hakes of the Nortronics Division of Northrop.

The final major award of the meeting was the Robert H. Goddard Memorial Award, presented at the banquet by Mrs Goddard to Wernher von Braun.

An indication of the thoroughness with which the ARS meeting had been organized was given on Saturday, October 14, when senior men from industry, government and education came together to discuss the challenge of the space programme to education. Edward Welsh of NASC spoke on the programme's objectives and accomplishments, Prof C. Stark Draper of MIT on the role of engineering, and Dr Robert Jastrow of NASA's Institute of Space Studies on the role of science. Senator Jacob K. Javits delivered a luncheon address on *Law and Education in the Space Age*, and simultaneous afternoon sessions on pre-college education, undergraduate education and graduate education were held.

So full had the technical programme of the meeting been that it was not until the weekend that many of the ARS members present were able to find time to join the general public in looking at the variety of spaceflight goodies on show in the exhibition halls. What they saw merits a separate article, which I hope will appear in an early issue.

On three levels the American Rocket Society's annual meeting and "Spaceflight Report to the Nation" had been an outstanding success. Specialists in the various branches of astronautics and associated sciences were able to hear an excellent selection of technical papers in their own fields; they were in addition able to obtain an overall view of the present status and future direction of the US space programme from panel discussions and well-chosen visiting speakers; and the meeting was in reality as well as in name a report to the nation in that the general public were able to visit the Coliseum's vast exhibition and to attend the evening and weekend sessions.

SPORT AND BUSINESS

To be Continued . . .

Thoughts on the Diamond Jubilee of the RAeC

BY B. J. HURREN

Early next year the Royal Aero Club will share with the Lansdowne Club the latter's imposing premises in Fitzmaurice Place, Berkeley Square

"Flight" photograph

As many *Flight* readers will know, the occasion of the 60th anniversary of the Royal Aero Club—founded in 1901 as the Aero Club—marks a severance with 119 Piccadilly and the beginning of a combined operation with the Lansdowne Club. Details of this move have already been published; but one may perhaps comment that the term "security of tenure for 73 years ahead" indicates an almost wild optimism in a future which many foresee as coming to a rapid end.

How stands the Royal Aero Club at this turning-point? And what has happened since its 50-year anniversary was recorded? The tally for today is that it has some 2,450 members, of whom 850 are townees, and an additional 2,000 associate members. There are approximately 6,000 private licence holders, despite the lack of encouragement by local authorities for local aerodrome use (some of these authorities are definitely anti).

Although the move to the Lansdowne Club premises opens up better facilities for RAeC members—fencing and swimming for example—perhaps the surrender of 119 Piccadilly is not unconnected with the traffic and parking problems now being created at Hyde Park Corner. But anyone who imagines it will be easy to park in Berkeley Square had better have a quick re-think. Furthermore, there is no bus to Berkeley Square.

Highlights of the past ten years to be noted by an embryonic research historian can be seen as follows. The demise of the Kemsley Trust has occurred, but we now have a combined SBAC and Shell £100,000 operation to replace it. The Briefing Service has been revived: it deals with flights from as far away as Australia and South Africa, whilst in reciprocation about 15 flights ex England occur each month with the help of RAeC facilities. Chaps even come from Holland to get maps at Londonderry House, for they cannot get them in the Netherlands. The library has developed scrappily—rather like the curate's egg, it is good in places—but there is still no regular fund, and this is an omission that might well be corrected with the new move.

The Club continues to fulfil numerous duties which, being virtuous, secure little general publicity. For instance, following some anonymous criticism that the Club was "staid," a 1955 issue of the *Royal Aero Club Gazette* listed no fewer than 42 "activities and achievements" over the previous ten years. In the 1950s, we can recall such major events organized by the Club as the National Air Races, highly successful rallies, and speciality events such as the England-New Zealand Air Race and *Daily Mail* London-Paris-London lark. At the same time, the Club was unable to do anything to prevent Croydon Airport being foully done to death.

On a broad front, a notable new trend has set in—the rise of the business pilot. Still mainly an amateur in a liberal sense, he can indulge his enthusiasm because crazy taxation laws have opened the gate to "flying on the company account" whereas the true-blue private owner would have to be a rich man indeed to afford the luxury of the high initial cost. However, there have risen heartening alternatives to the influx of American "light" aircraft (said to amount to over £1,500,000 in total cost in the past three years) with the advent of the Beagles. *Floreat* Masefield, coupled with the name of Pressed Steel. In parallel, we can say a farewell to the Bradshaw type of navigation and note that radio communication will be a MUST as space control demands direction of all air traffic.

One notable outcome of the past ten years has been a great increase in the numbers of oil-paintings of famous personalities of the Club. These deserve a better collective display than the walls of 119 Piccadilly could offer.

Some hitherto unpublished information on my book about the Club, *Fellowship of the Air*, may now be given. First, there are many omissions, as a result of (a) a time limit—11 months from scratch to publication—and (b) paper shortage and control at the material time. Thus, some 126,000 words were written for the original MS, and this was by *force majeure* cut to the published 88,000 words.

It was, in retrospect, a most difficult assignment, because all the "copy" was vetted by a books committee. Bless his heart, few know better than I how pernickety Bob Mayo was; and even fewer can realize how inaccurate were the memories of people of pioneer days. What seemed perfectly acceptable (and, indeed, long recognized) statements were challenged from veteran memories; had to be checked and cross-checked; and often, when some committee-member dug his heels in, altered against my better judgment and almost certain knowledge. I learned to shudder at the mention of the word "first"; currently I note that there is a private war on as to who did the first spin. But, believe me, as soon as the word "first" appeared in the MS it was challenged; and after publication there arose hornet-like clouds of scribes to denounce the claim. Advice to future aeronautical historians: *never* use the awful word "first."

I now want to make a public apology for a mistake that should never have happened. As I mentioned above, time was at a premium: indeed, of the available 11 months I studied documents for nearly six, wrote the text in less than three, and then had the mechanics of squeezing it past the committee and into the space allotted me by the publishers; finally, I had to do the illustrations, captions, indices, etc.

A most distinguished member of the Club is Maj A. J. Michell-Clarke. (I pray the printer gets that name right this time!) I recall that I was having an up-and-downer with the publishers' editor, who simply and understandably could not believe there was a chap named Barrington-Kennett and also a chap named Kennett-Barrington. I won this private battle, and had hardly done so when I noticed a reference to Captain Mitchell-Clark, and at once altered the proofs. Press date was very near; and I would point out that in the London telephone directory there are six ways of spelling that which we speak of as "Mitchell" and two ways of spelling Clark, the hyphenated name being an additional handicap. I recall that three times the proofs went back to the printer . . . and, when the book was published, there, glaring from the page, the name of Major A. J. Michell-Clarke was mis-spelt. My apologies, very belatedly in writing, to that popular member "Mickey" Clarke.

I had much trouble over the title; and I still do not like the present one, which was suggested by someone on the books committee. My original choice was *Nostalgia Aeronautica*, which is exactly what the historical record was. This was rejected out-of-hand with such devastating comments as "What's it mean?" "Nobody would dare ask a bookseller for that title" and even "We didn't all bloody well learn Latin."

So, I tried *Dominion over the Air*, pinched from Genesis. This was flatly refused. I then asked Oliver Stewart for help, and he offered the excellent title of *Companions of the Air* (the implication being of an Honour, which indeed it was to have been one of the pioneers). This was changed to *Fellowship of the Air*, a title which irritates my professional eye.

Since a club is only the resultant of its members, I would like to indulge in a personal *nostalgia aeronautica* covering the past decade. I note, happily and predominantly, that "Brab" is still the guiding star. Lord Brabazon flew in France as long ago as 1908, and on May 2, 1909, he became the first officially recognized flight-maker Englishman in England . . . He has been the unfailing sheet-anchor of the Club since its beginning, and I record with a smile that as long ago as 1952 he referred to his "preposterous longevity." All in the world of aviation, abroad as well as at home, will surely join me in hoping he reaches at least his "ton."

In the past decade that suave and svelte steward, Mr F. H.

SPORT AND BUSINESS...

Rideout, has retired, and to the great loss of the Club "Tony" O'Connor joined the Cavalrymen. But with Mr Blackburn beaming around, with Chris Nutter o.c.bar, and Fred Arthur as head porter, the Club continues fortunate in its servants. As for "Elsie"—*she* is the one who ought to write the Inside Story, and what a tale she could tell over five and a half decades!

Many have left the caravan as it passed on; and before memory fades completely may I indulge in some pen-portrait recollections? At random, then, I regret the passing of Bernard Stevenson—"Steve," so gentle and self-effacing and unobtrusively efficient as assistant secretary. In a lonely flat in an obscure London suburb, blind, aged, frail, forgotten, died Maj C. C. Turner, who in 1908 flew to Russia in the *Mammoth* balloon. Not so long ago, Harry Delacombe was out and about; in advanced age he was as spruce and sprightly as when he was a midshipman in 1872 (Harry was originally barred from membership because, around 1906, he wrote for *The Times* newspaper). Then that unique character C. G. Grey took the long trail; he hated to be called a journalist, but in fact he was one of the best, and his duels in print with that Canadian crustacean Cy Caldwell were a joy to read (Cy until at least recently was living in retirement near New York—he wrote me a letter full of the old fire and brimstone).

Alas, no more shall we hear Goodman-Crouch and his famous croak of a voice. As a boy Goodman was apprenticed to (I think) Renault in Paris, and his rendering of *la langue verte*—the almost forgotten language of medieval Paris—was a singular accomplishment. Impish John Boothman, so modest despite his so many achievements, is sadly missing; but for the Armistice of 1918 he would have been court-martialled for joining the French Army Red Cross and serving at Salonika wildly under-age! The saga of Claude Grahame-White has also ended: the things that man did in the pioneer days, when—*pace* the SBAC Farnborough Display figures—no fewer than five million people turned out to see some of his flights!

One of my particular buddies was Prince Viazemsky; he would explain how easily his name could be remembered, because *via* meant road and hence earth; *zem* meant water in Russian; and *sky* was obviously air. I believe his account of his man-powered flight attempts and minor successes pre-1910 has never been published—but *please*, Messrs Gibbs-Smith, Geoffrey Dorman, etc, note that he *never* claimed a First (see above). He was concerned with the big Sikorsky bomber, vintage 1914, but for many years lived in a vast house on Wimbledon Common, dreaming of inventions that did not materialize.

Cheerful Col W. C. Devereux has also gone. The official history books ignore the fact that he (a) was certain the Germans would bee-line for his factory—this before 1938; and (b) actually built his own air raid shelter in anticipation of an event that did come true. In his foresight, he asked the Home Office to supply him with an incendiary bomb and a shovel for picking up same. They did. When he had a dummy run in his factory, the incendiary easily burnt through the official shovel. To his complaint about this the Home Office replied that he was "using the wrong type of shovel for that type of bomb"!

Sadly I personally miss Frank Hillier, who at the age of 17 was picked out by the great Lord Northcliffe and packed off to America to open an office. Frank subsequently lived long in Paris, and his anecdotes of La Ville Lumière were jovous indeed. And then Guy Trundle, immaculate, always talking of the hunting field (so much so that some thought he should have been with Hunting instead of with G.E.C.).

Robert Blackburn, that great-hearted Yorkshireman, was one of those with fickle memory. I used to consult him in his flat at 55 Park Lane, and after a few whiskies he would say: "Come up to Yorkshire—I've got the records there." But in Yorkshire there was great hospitality, talk far into the night, and an assurance that the records must be in London after all.

Maurice Wright was a man for all seasons. His stories of his flights in Arabia in the First World War were a delight, whilst in the days when the Salon Aéronautique was in the Grand Palais he took particular delight in not paying the old woman in charge of the *toilette* the then customary 20 francs on the ground that he had "*rien fait*."

A strange death overtook Capt C. W. Byas, one of the early Fleet Air Arm pilots. He fell out of an aeroplane while on a joy ride in East Africa. Coming from South Africa, at first he had the obvious nickname in the Royal Navy of "Baas." At an early stage in his Service career it was changed to "Boosy" after some hectic party in the dear old *Glorious*; then it reverted to "Baas" as he rose in rank, and finally reverted to "Boosy" as he passed the chance of flag rank. It was in his flat in Fulham, on his farewell party when he decided to quit England for Africa on retirement, that the present RAeC secretary-general, Col Rupert Preston, showed the photograph of Hume, of Setty case notoriety, which proved invaluable to the police. Hume had had no photographs taken except one for his "A" licence . . . and the Royal Aero Club had it!

Nobody can fill the gap left by Sir Francis McClean, all of whose records were destroyed when his house at Henley-on-Thames was taken over by the Army in 1939. Nobody knew why it took club-member John Newling about five years to paint the excellent portrait of him now in the possession of the Club. The fact is Sir Frank—he was always "Frank McClean"—liked to come to the bar on Saturday mornings where, ostensibly, dear John Newling was studying him . . .

Sir Alliott Verdon-Roe; Gordon Olley; Gp Capt Rollason; Raymond Quilter; Capt A. G. Lamplugh; Air Cdre Maycock; Maj Shilson; Bennett-Baggs; Fred Sigrist; Mike Hawthorn; Ronald Walker (he really did come from Wagga Wagga!); all these have gone in the past decade. But perhaps nobody worked more indefatigably abroad than Capt "Ken" Bartlett . . . the *parfait gentilhomme* in glorious morning dress at the Paris Salon. The French used him as what might be called a second-line broadcaster at Le Bourget displays. Once, at Le Bourget, he reassured the masses by saying both in French and English: "There is no need to worry—the Salon authorities have at their disposal 70 ambulances, and more than 100 doctors of the Reserve are in attendance!" Perhaps his greatest feat was not in aviation at all. It happened this way. As the Germans advanced into France in 1940 there was a retreat to Bordeaux. British people were advised to get out quickly; priority was given to married couples living in France. Now, the fact is that many "married" couples were not married by law, and refused to be parted. Ken found the consul's office deserted, and with great initiative used that official's stamp to "marry" devoted couples who, thus armed with the requisite piece of paper, escaped by sea to England and security.

Clearly, the Royal Aero Club has never been devoid of colourful characters, and so it remains today—though it would be clearly invidious to mention names from the present 2,000-plus members. One knows some of the members of the Lansdowne, and without denigrating them in any fashion one can truthfully say that they will benefit by the combined operation soon to be in being. Perhaps one may add a small warning: on the walls of 119 Piccadilly used to hang, in a glass frame, the *Rules of the Club*. One day a completely exasperated member seized an orange, flung it at the rules, smashing the glass, and shouted: "Tell the secretary I'm the only man who has broken all the rules of this club. Give me a resignation form!" No names, no pack drill . . .

ANNUAL DINNER of the Association of British Aero Clubs and Centres will be held at the Waldorf Hotel, London, on Friday, November 3, at 7 for 7.30 p.m.

THE AUSTRALIAN GOVERNMENT'S SUBSIDY to gliding clubs is to be increased this year from £3,400 to £5,000. Of this amount £2,600 is to be distributed directly to clubs by the Gliding Federation of Australia, in proportion to membership and the number of gliding certificates gained during the past year. The Government is to consult with the GFA Council as to the best manner of distributing the remaining £2,400. In addition, a grant of £800 towards the operating cost of the National Gliding School in South Australia will again be made this year.

INCREASED RANGE for the Grumman Gulfstream has been made possible by the addition of extra wing fuel cells which increase the fuel load by 1,640lb to a total of 12,100lb. This modification, recently certified by the Federal Aviation Agency, increases the range by 400 miles to 2,940 miles. A modification programme for a number of the 75 Gulfstreams currently in service has been started.

ARMY PUPILS of the RAF Geilenkirchen Gliding Club, in Germany, with one of the club's Slingsby Skylark 3Fs

Windscreens by TRIPLEX

Flight, 26 October 1961

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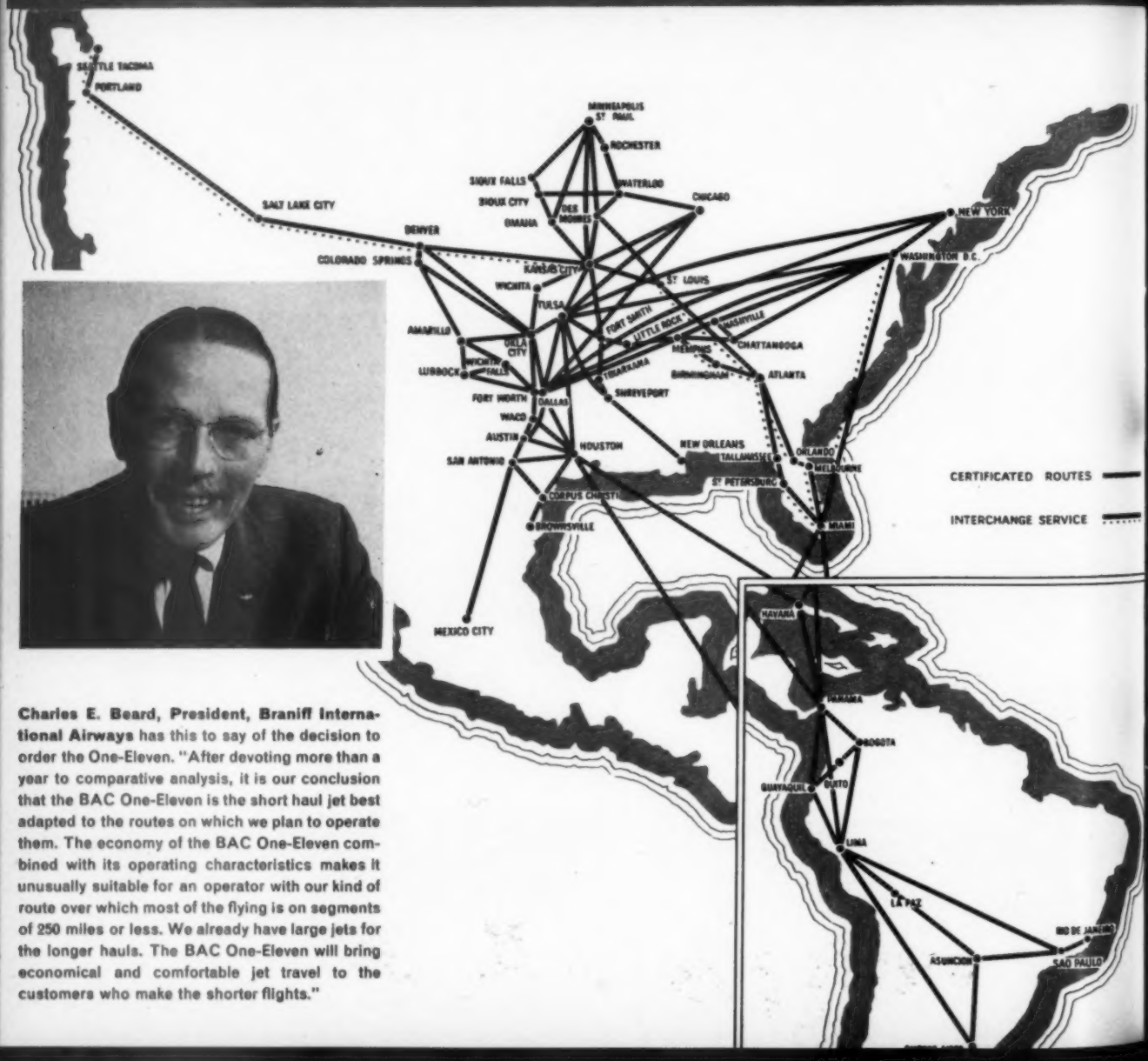

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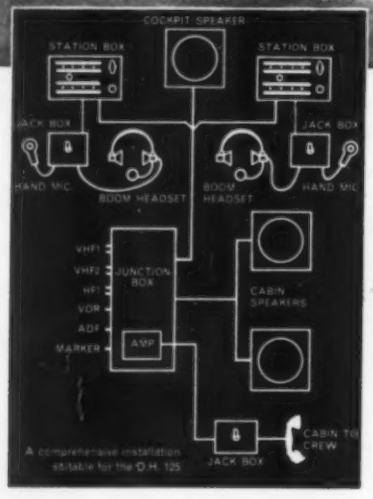

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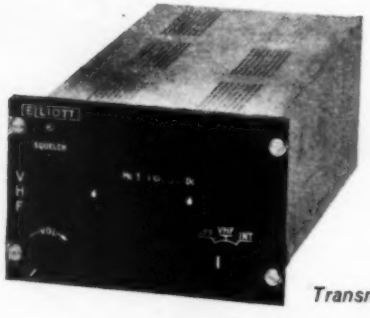
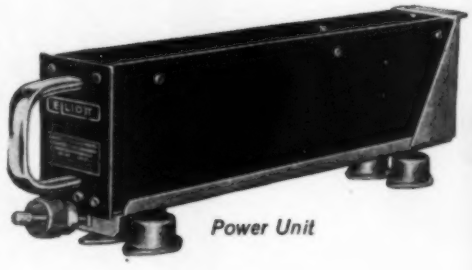
The power unit is contained in a half-height short ¼ ATR case which can be mounted remote from the transmitter-receiver. No special cooling arrangements are necessary.



Transmitter-Receiver



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Double-ended loading and unloading at Tinker Air Force Base, Oklahoma City

Riddle's LogAir Argosies

ANOTHER USAF DEMONSTRATION

By Fred B. Stauffer ("New York Herald Tribune")

LAST week a "Flight" staff member recorded his impressions of Riddle's Argosy operations following a visit to the airline's base in Miami. Here an American writer describes a subsequent USAF presentation of the Argosy at Tinker AFB, Oklahoma City. An earlier USAF Argosy demonstration, at Stewart AFB, was described in "Flight" for September 21.

Oklahoma City

"*THE first commercial cargo aircraft capable of cutting ton-mile costs from present levels of around 14 cents to 5 or 6 cents*" . . . "*A milestone in the modernization of the Logair fleet.*" These and similar comments on the Argosy were freely expressed by Congressional, military and industrial aviation experts at a two-day demonstration here earlier this month of the aeroplane's capabilities. Thorough inspection of the Argosy loading techniques and detailing of its already established performance on the USAF Logair routes flown by Riddle Airlines left the visiting group convinced that this all-cargo aircraft is playing a major rôle in the defence efforts of the United States.

US Senator Mr Mike Monroney of Oklahoma, an aviation authority and spokesman in the Senate, Col C. H. Davis, chief of the Logair division of the Air Force Logistics Command, and Mr Robert M. Hewitt, president of Riddle, were among those paying tribute to the efficiency and economy of Argosy operations.

The demonstration included inspection of the Oklahoma City Air Materiel Area at Tinker Air Force Base, the heart of the Logair network, and the complementary base of Riddle Airlines at Will Rogers Field where it is expected that the company's entire Argosy operations will be based. Both installations afforded the visiting group an opportunity to see the complete warehousing, loading and unloading facilities of this logistics operation. Tinker Air Force Base was selected as the largest installation of its kind in the US Air Force.

A highlight of the two-day show was the actual loading of 18,000lb of palletized cargo into an Argosy in approximately ten minutes. Ten pallets each bearing up to 2,000lb of miscellaneous material for various destinations were pushed into the aircraft from rollers on a truck floor matching in height the rollers in the fuselage. The load was made secure, the doors closed, the Argosy taxied out and, after a takeoff roll of 4,000ft, soared to the north-east on a well-established route-pattern of Logair stations.

This brief demonstration, and the earlier showing of the routing and sorting of the cargo in the warehouse, provided tangible evidence of the combined efficiency of the loading and flying capability of the Argosy. Not least important, perhaps, is the enthusiasm of the crews. The men, according to a Riddle check pilot, find the Argosy has thoroughly desirable handling characteristics.

The entire Logair system has grown from 14 in 1954 to 89 stations now. These include nine major material areas, five embarkation points, and seventy-five customer bases. On a seven-days-a-week basis Logair operators must provide a guaranteed airlift to keep tactical units combat-ready. They must expedite delivery of critical and high-value items to reduce inventories and pipeline time.

Logair routes embrace in general trunk routes, now operated mainly with Douglas DC-6 aircraft; feeder routes, on which the familiar C-46s tote their loads; and modernization routes. These latter are essentially feeder routes of relatively short length but high priority. The Air Force has been seeking the most modern aircraft available to augment the Logair fleet as the need increases. In line with this policy the first selection was the Argosy. And to the Argosy, operated by Riddle, has been assigned the task of covering the high-priority routes. The Strategic Air Command (SAC) has aircraft on short-time alert at bases all over the USA. It has replacement parts in being, but must get them to the proper points regularly. The Argosy fleet of Logair has been assigned a big share in that task.

In three months to September 30 the Argosy fleet lifted more than 30,000,000lb of regular and outsize freight and has flown more than 1.1m miles. With stages running from 100 to 1,000 statute miles the Argosies have made in this period some 2,990 landings and have uplifted a total of more than 11m ton-miles of cargo. In achieving this performance the Argosies have recorded an average daily utilization of 9hr and 13min, increased now up to a rate of 12hr per day.

While the Argosy has built-in characteristics for economical and speedy handling of air cargo, military or civilian, at even relatively small airfields, the facilities of the air freight terminal at Tinker Air Force Base outside Oklahoma City give such aircraft an even better opportunity to demonstrate their worth. The Tinker base is the largest Air Force installation in the country and serves all types of air freight operations in addition to the Argosy fleet. Its cargo-handling facilities are the most modern in the United States. They are almost completely mechanized but not yet fully automated.

This Oklahoma City Air Materiel Area terminal was built at a cost of $1,700,000. Included are a 44,000 sq ft building with a warehouse section of 30,000sq ft and a finger of 9,000 sq ft, plus a vast loading apron. Five aircraft can be accommodated at once at the finger.

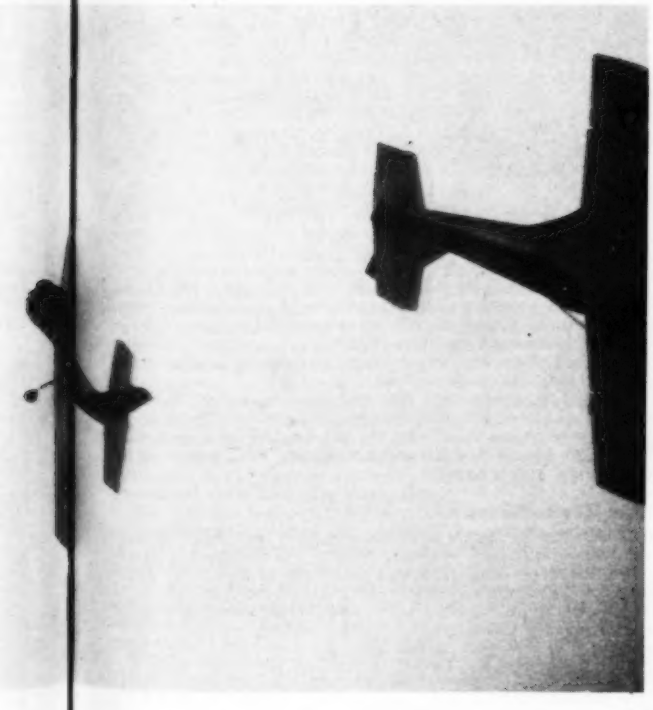
Flights at the terminal average 925 a month, and are destined for the 89 Logair destinations. Monthly average cargo processed through the terminal is 5,000 tons. Maximum capacity is 7,500 tons. The terminal is the heart of the Logair network, being geographically close to the centre of the United States. Routes radiate from coast to coast and border to border.

All but the largest and odd-size cargo can be handled within the terminal and on its conveyor system. This fact accounts for 93 per cent of the volume handled. "Pre-palletization" is a major factor in reducing the ground time for the aircraft involved. Time is money, but in this instance time could mean increased credibility of the US deterrent.

Present at the recent USAF demonstration of the Argosy at Tinker Air Force Base were, from left to right, Mr Robert M. Hewitt, president of Riddle Airlines; Senator A. S. Mike Monroney of Oklahoma; Maj Gen Lewis L. Mundell, commander of Oklahoma City Air Materiel Area; and Mr R. E. LeLong, general sales manager, Armstrong Whitworth Aircraft

UP, DOWN and N

UPSIDE DOWN and DOWN UNDER



Though these pictures may seem a trifle "old hat" to Australian readers, they will come as an exhilarating change to many of us in other lands. They were taken at two displays earlier this year. Adopting an Antipodean attitude at upper left is a Commonwealth-built Avon-Sabre, and to the right of it is another Commonwealth product, the Ceres agricultural aircraft. The three pictures running diagonally across these pages show yet another Commonwealth type, the Winjeel basic trainer. In fact, the only odd-man-out is the Dakota seen immediately above, either on a cross-wind approach or purposely diverting the visitors.

The main battle staff position in the Combat Operations Center at the North American Air Defense Command in Colorado Springs. During exercise Skyshield II, aircraft were plotted on the projected map and various defence systems could be alerted from this room

FLIGHT SYSTEM SURVEY

Decca's Big Step Forward

THE flight trials programme of the Decca Mk 3 Self-Setting Flight Log and Omnitrac computer have now been completed and the company were demonstrating the equipment in their Valetta from Gatwick last Monday. Both the new developments have very considerable significance in the navigation field, because they provide a Decca presentation which is undistorted, a recording pen which sets itself anywhere on the Flight Log chart without manipulation, and a dial giving separate range and bearing indication to any chosen location pre-set in the Omnitrac computer. The bearing signal can additionally be coupled to monitor the autopilot for automatic track-keeping; and Omnitrac can operate in conjunction with Doppler, inertial or air-data navigation systems.

During one flight in the London area, the track of the aircraft was plotted continuously on an undistorted chart and the range and bearing to Gatwick were continuously displayed on the meter. The equipment thus provides not only position and track, but bearing and distance to any selected reporting point. Signals incorporated in the nine-digit self-setting tracks along the edge of the chart will automatically control chart changing and the repositioning of the pen without switching by the pilot. The Decca chart service is, of course, also equipped to produce *ad hoc* charts for a particular flight within 24hr.

Kollsman Instrument in Britain

A SUBSIDIARY of Standard Kollsman Inc of Chicago has been established in Britain with the name Kollsman Instrument Ltd. Announcing the new venture, the president of the American company said that Kollsman Instrument Ltd will "introduce the total Kollsman capabilities into the British market." They intend to supply the Air Ministry and aircraft manufacturers, including the aerospace industry, with the full scope of Kollsman's technical capabilities in the astro-compass, instrumentation and navigation systems fields. Kollsman's technical and research facilities in the US will be utilized by the British company in serving the requirements of its customers.

Mr Alastair A. Brown and Mr Francis G. Thouard have respectively been appointed managing and deputy managing directors of Kollsman Instrument Ltd. Mr Brown was formerly chief development engineer with Smiths Aviation Division at Basingstoke and Mr Thouard was responsible for the sale of a wide range of aircraft instruments with Kelvin Hughes.

Check-out for the Lightning

THE RAF has ordered from Honeywell Controls Ltd a number of systems analysers for automatic pre-flight check-out of the Lightning. The equipment and its principles of operation were described in an article in the aviation electronics feature in *Flight* for October 5; and this order represents the first by the RAF of such equipment for aircraft.

During a conference in London last week to announce the order Honeywell Controls Ltd showed a film of their systems analyser type UG-897 being used with the F-101B, for which it was developed some two years ago. The USAF at that time had difficulty in keeping the F-101B serviceable and the systems analyser could, for example, completely test every mode of the autopilot in 2½hr. The task would take several days by other methods. It was also arranged to check the air data computer, fire-control system and weapon computer. Honeywell in America next produced analysers for the F-104, the X-15 rocket-powered research aircraft and the SD-105 drone.

The new analyser for the Lightning has already been designed and the first example will be completed "in a matter of months," but no firm details can be released except that it is rather faster than existing Honeywell analysers. As much as possible of the system will be produced in Honeywell Controls' factory at Hemel Hempstead, Herts, and the British company will therefore have something of a lead in Europe in such production. The possibilities of exporting British-made Honeywell analysers are good.

The company point out that the analyser could be applied not only for flight-line (or first-line) servicing, but all the way through to the production line, providing a means of checking equipment to a constant standard at all stages of its life. Yet another extension is the use of check-out equipment installed in the aircraft to monitor appropriate systems throughout each flight. By this means the crew would be immediately warned if a unit failed or went off limits and immediately on landing they would also be able to indicate the unit to be changed. Prompt warning of failure would itself be useful, but the ability to indicate with certainty any unit to be changed could significantly shorten turn-round time.

In the USAF system of maintenance, unserviceable black boxes are returned to the manufacturer for servicing. Many of the boxes so returned were found to be serviceable, because the engineer had experimentally removed a number of boxes in trying to cure one fault. The systems analyser pin-pointed the correct box to be removed and avoided maintenance "by ear." On the other hand, many of the boxes returned were found to be far outside limits, indicating that they had been used for some time after they actually became partly unserviceable. Again, the systems analyser could prevent such cases.

Honeywell showed an actual UG-897 analyser for the F-101 going through its 25min self-checking routine. The system was mounted in a rubber-tyred, towable trolley with air suspension and performed six steps per second in normal testing routines controlled by its self-checking tape. Certain tests involved time constants and a light indicated when one of these apparent pauses was in progress. Digital read-out showed the number of the test being performed. When a fault was notified by illuminated label the operator could move a roll chart to the test number and see where the fault might be. Sub-routines were then selected to narrow the search down to an individual, quickly removable module. In service, the self-checking routine is carried out immediately any fault is indicated so that there is positive assurance that it is the aircraft unit and not the analyser which has failed. Although the analyser is mainly electronic, it can handle pneumatic and hydraulic systems as well.

Two New Weather Radars

RECENTLY announced by RCA are the AVQ-55 and AVQ-20 airborne weather radars, intended respectively for the smaller twin-engined business aircraft and for jet airliners. RCA claim to have developed new circuit techniques which have made it possible to package each of the new sets in three units, aerial, receiver/transmitter and indicator.

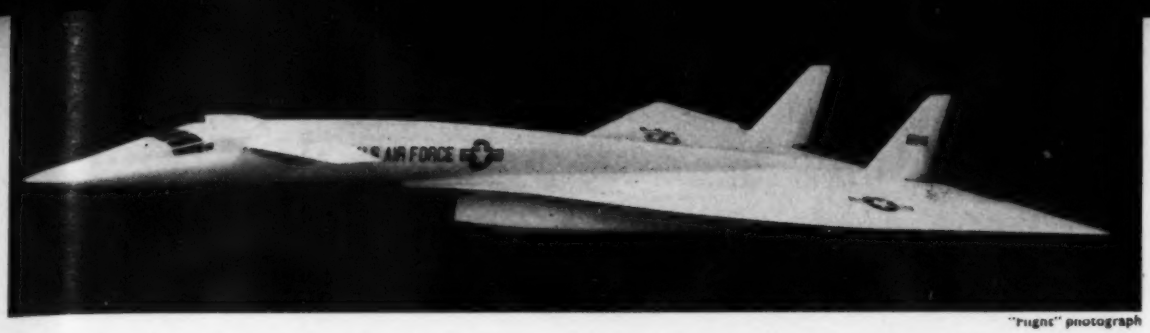
The AVQ-55 weighs only 40lb and has a range of 90 miles. Aerials of 12, 15 or 18in diameter can be supplied. The AVQ-20 has a range of no less than 180 miles, but weighs only 45lb. Aerials of 12, 15, 18, 24 and 30in diameter are offered. Both radars will be manufactured in Los Angeles.

Radar for the Belfast

TEN E190 weather radars in duplicated form have been ordered from Ekco Electronics by Short Brothers & Harland for the Belfast freighters. The duplicated E190 has dual receiver/transmitters and indicators and either receiver/transmitter can work with either indicator. Ekco are also to supply weather radar for the Comet 4 recently ordered by King Saud of Arabia.

Lufthansa have ordered 22 Collins DN-101/NC-103 Doppler navigation systems and have an option on a further 20. The sets will be installed and maintained by Collins Radio Co GmbH.

Trans World Airlines have ordered another 27 Model 109-C flight recorders from Lockheed Aircraft Service. They are of the mechanical type, inscribing on aluminium tape traces recording airspeed, altitude, heading, vertical acceleration and elapsed time. More than 600 recorders are already in service in jet airliners.



"Flight" photograph

This new photograph of a B-70 model reveals the camber and curvature of the wing leading edge; in earlier illustrations the wing was a pure delta

WEST COAST RESEARCH

HIGHLIGHTS OF THE RECENT US VICE-PRESIDENTIAL TOUR

BY IAIN PIKE

RIGHT on time on October 3, the Boeing VC-137A carrying Vice-President Lyndon Johnson to California rolled to a halt at Moffett Field. The military precision with which the tour was carried out called for a tribute to the organizers. The Vice-President's reasons for making this particular trip—after an exhausting pace of travel outside the US in the previous few weeks—can be best described in his own words.

"At the request of President Kennedy, I have come here to visit with you, to learn as much as I can of the actual operation of one of America's most vital programmes, and to help him prepare recommendation for stepping up the space programme to even greater heights. In Washington, it is all too easy a matter to conclude that the work is being done in the nation's capital. Actually, however, we know that a major share of it is being done right here by the dedicated scientists, technicians, and workers of America.

"This Administration has a very deep appreciation of the urgency of our space programme. The road to future strength and future prosperity—and we hope to future peace—lies through outer space. As the leader of the Free World, the United States must travel that road confidently and as rapidly as possible. To that end, the Congress which just adjourned stepped up our space programme and backed the President, who had ordered 'full steam ahead.' The money involved will be the best investment America ever made—because of your efforts.

"I am here to listen and to learn. As chairman of the National Aeronautics and Space Council, I have the responsibility of making recommendations to the President. I learned many years ago that a man's judgment on any given subject is no better than his information. I am coming here because you are the source of that information, just as you represent the source of America's greatest strength—the scientific know-how that someday in the forseeable future will take us to the Moon and even beyond."

It must be evident that a two-day tour of four major NASA space operations in California could be no more than "once over lightly." It is equally evident that political considerations were of equal, if not greater, importance in keeping the Vice-President technically up to date.

Ames Research Center From the Moffett ramp the Johnson party was ushered into the flight-simulation laboratory, where there was a short discussion on the problems of piloting manned space vehicles. As with all briefings held on the tour, time was very short. Ten minutes was considered adequate for an excursion into the main areas discussed. The two motion simulators being used for initial research into pilot problems expected in the Apollo man-in-space vehicle were set into motion. They showed conclusively why such elaborate simulators are needed in such projects. There followed a presentation of differences between aircraft and spacecraft problems: the spacecraft has low damping, weak controls, different control inter-actions and guidance problems, and an entirely new environment posing many hazards. The discussion of environment turned to the emergency systems required. Judging by the exhibit of a fighter-like escape seat, no man on his way to space can expect to have much apparatus to save his life once beyond the initial launching boost phase.

The flight envelope of the SST was turned to only briefly. Major problem areas were listed as: matching the propulsion system to the airframe; the transonic speed range; fuel problems; and low-speed characteristics, with reference to landing roll and attitude. In a chart showing the speed development of previous transports, there were question marks in lines devoted to the B-70. It was candidly announced that the speed range of the B-70 would provide much data of interest, but that the aircraft itself had been designed with little consideration for noise problems, sonic boom included. The B-70 was going to accelerate at much lower altitudes than those considered reasonable for operating an SST. The military were little concerned with the high-speed landing characteristics of the B-70, compared with the desirable low-speed envelope for the SST.

Charles Harper, chief of the full-scale and flight systems division, suggested that a motion simulator would be of great assistance in developing a supersonic transport. This simulator could be used in studying the pilot's control problem across the entire flight envelope. Such a machine should be in design a year from now, to be operating by 1965 to help the designer face handling problems after models have passed through tunnel design stage. The audience was fascinated when a pilot went through the operating parameters of various configuration, weight, and speed modes in a transport simulator. A "what the pilot saw" readout displayed on a closed-circuit TV screen emphasized the problems of landing such an aircraft in simulated reduced visibility. The way the simulated high-intensity lighting flashed on and off the screen after breakout in a low ceiling at high speed—off track—was ample demonstration of the problem to an audience who were probably unaware of the physical difficulties facing the man up at the sharp end.

A relief from the outpourings of facts and figures about simulation came with a flying demonstration of STOL and VTOL research. Ames Research Center is based on Moffett Field, an active Navy Air Station located some forty miles south of San Francisco. The Lockheed C-130D, with boundary-layer control over the flaps and control surfaces, gunned into the air, lightly laden, in about 600ft; and while it was going around in the landing pattern, the Bell X-14A danced a light fantastic over the grass. Up and down and around, at 30ft, two GE J85s (replacing Bristol Siddeley Vipers) burned a sizeable patch in the grass. Any jet VTOL gives me the impression of being on the verge of tumbling out of control, but the X-14A demonstrated just about every manœuvre known. It has demonstrated hover ability at altitudes as high as 5,000ft. And then the STOL C-130 approached at 70kt, touched at 60kt and braked hard in 500ft (that's what the man said). The rebuilt Ryan VZ-3RY Vertiplane, which uses the deflected-slipstream principle for its VTOL performance, was parked as an exhibit next to the Army Bell XV-3 with its huge swivelling rotors. $150,000 and several months of banging have restored the ungainly Ryan to flying condition after a fatal acccident.

Julian Allen, Assistant Director of Ames, told the Vice-President that the Apollo spacecraft would enter the Earth's atmosphere at 25,000 m.p.h., which is twice as fast as the Mercury capsule and creates 30,000 BThUs per pound of vehicle weight. Dissipating this amount of energy is a major problem, but later in the tour the solution at least seemed to be well on its way. Apollo will have to re-enter the atmosphere tangentially, and orbit the Earth once before landing. The Atlas Mercury does not have to reach escape velocity, but a figure of 23,000 m.p.h. was quoted for the Apollo exit—a speed which was compared with meteor velocity, something covered later in the tour. Hypersonic wind-tunnel director Clarence A. Syvertson defined the width of the Apollo re-entry corridor for deceleration without heat damage as being greater than the Atlas Mercury eight-mile entry corridor, where the L/D ratio for the capsule is about 0.5. He suggested that a 40-mile width after an orbit was indicated by tunnel research conducted on the probable Apollo shape with an L/D ratio of 0.7. The blunt object shown as the probable shape resembled a whale's head, with four flat speed brakes extending at 60° from its squared-off base. Then the room shook for a full minute as the Mach 5 to 15 tunnel was brought up to speed; the model under test was the same Apollo capsule.

Discussion of heating problems was continued when the group moved into the combined heating facility, to be confronted by a lethal-looking arc-type heat simulator. Here Mr Johnson learned that the Apollo capsule would be subjected to both convective and radiated heat on its way back into the atmosphere, whereas the Mercury capsule, at its maximum 18,000 m.p.h., faces convective heat only. The heat simulator was being used to examine ablative shields for Apollo. The 1in-diameter phenolic-resin/glass-fibre specimen, shaped roughly like the Mercury capsule with the parachute end on a rod, was vaporized before our eyes. With this particular specimen the resin vaporized, allowing the glass-fibre filaments to stream back around the maximum diameter. Sample test specimens examined had been made from polyethylene, polycarbonate,

Take-off on October 11 of the NB-52 from Edwards AFB carrying a North American X-15 which after release zoomed to a height of 215,000ft (40 miles). In the subsequent 4g pull-out the port windscreen shattered, but the sections remained in the frame

WEST COAST RESEARCH . .

and Teflon. While the other samples showed obvious signs of heat damage, the last-mentioned came through very well.

Research scientist Dr Dean Chapman contributed what appeared to be a long and unrelated digression on tektites. Fascinating as the description of the glass morsels from space turned out, the audience began to ponder upon the value of becoming tektite experts. It was not until the magic number 25,000 m.p.h.—tektite entry velocity—was given that the significance of the little glass objects was realized. The samples shown had been found in Western and Central Australia and belong to the British Museum. Most tektites enter the Earth's atmosphere as small glass spheres of about 1in diameter, but burn down to slightly larger than a jacket button. Artificial tektites can be used as standards for comparison in the heat simulator. In this way, the heat-resistant properties of materials studied for use as ablative heat shields for 25,000 m.p.h. entry can be measured with some precision.

Next on the list of briefings came "Research at Spacecraft Speeds and Temperatures" in the hypersonic ballistic tunnel facility. Here the Vice-President was told of models of hypersonic craft being fired through the instrumented test section of gun-barrel tubes. Speeds of up to 22,000 m.p.h. had been reached in the tubes, which when combined upstream with the hypersonic shock tubes produced relative velocities up to 30,000 m.p.h. Some time was given to a discussion of meteorite problems in space, which were being studied in the tubes. Short film clips, taken at 1,400,000 frames/min, showed the destructive effect of meteorites on vehicle structures (the film clips were reshot at one five-millionth of the shooting speed). Small glass spheres were fired into 1/16in-thick double-walled aluminium-alloy structures, at velocities up to 23,000 m.p.h. The audience was surprised to learn that such a structure is as effective, in stopping particle penetration, as a single 0.5in sheet. The destructive effects of the particles entering a space-craft were measured on a third sheet of material behind the double-wall structure. It was discovered that when particles are fired at an angle of 45° and a velocity of 19,000 m.p.h. pulverization of the glass projectiles is complete, and small particles are spread over a relatively large area, compared with a velocity of 7,000 m.p.h. at which the glass clusters. Interestingly enough, damage to the third sheet is the same at the two widely separated speeds. The chief of the hypervelocity ballistic range, Mr Thomas Canning, suggested that meteorite velocities ten times those under investigation could be anticipated in space, and would somehow have to be explored.

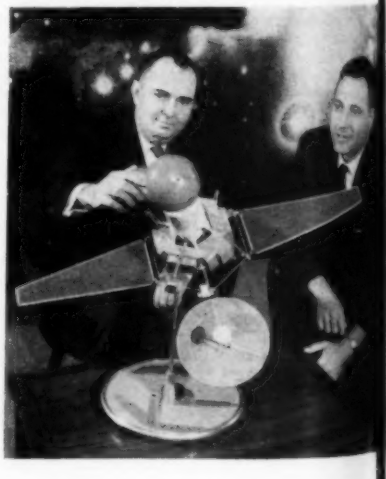
Our future space-travellers' vehicle was going to be eroded by ions, bombarded by protons and its communications disturbed by solar flares. And other hazards were brought to the Vice-President's attention by the chief of vehicle-environment, Dr Alfred Eggers. Ames is conducting extensive research with solar proton analysers and solar emission receivers. The facility has three ion accelera-tors, the most powerful working in the 50-200KV range. Explorer 12 had shown that the low-energy proton particles, the most populous in space, existed in a density of one particle per cubic centimetre. This result was obtained when the slit entrance to the satellite's proton analyser was turned away from the Sun during its swoops from an apogee of 5,000 miles to a perigee of 200 miles. Solar flares on the Sun were described as "a great mystery" which needs to be cleared up by sending a satellite around the back of the Sun in order to correlate interference data with observations on Earth. A probe shot 1/10th of the distance towards the Sun (i.e., 9,000,000 miles) was held immediately possible. All these radiation studies would benefit the design of Apollo, according to Dr Eggers.

LBJ's tour of Ames was wound up with a brief description of Apollo guidance problems. This research is being conducted by the Mas-sachusetts Institute of Technology group which was responsible for the early work on Polaris guidance. But no comparison in com-plexity is reasonable between the Polaris and Apollo guidance systems, the latter being infinitely more complex. Desired terminal guidance accuracy to the Moon was described as being six miles to the Moon approach point. In the first system study the best possible manual optical inputs for correction into the mid-course guidance system computer were not accurate enough. Later, in some mysterious way, probability came to the rescue of the com-puter inputs, and in a recent exercise landed Apollo within two miles of the approach spot.

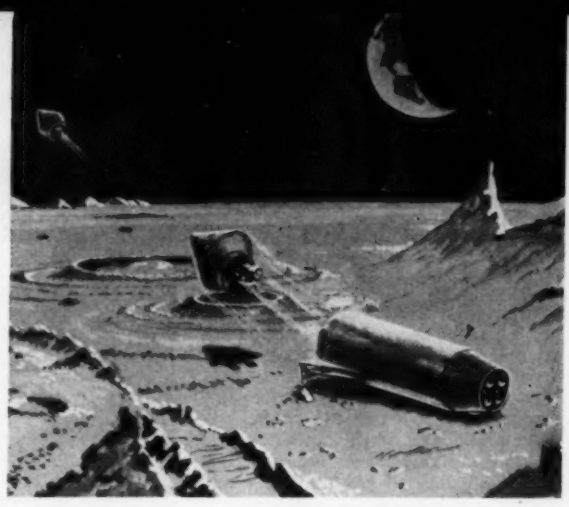
Edwards Air Force Base Official greetings at the NASA Flight Test Center were made in the hangar before the X-15 which recently suffered 1,000°F over much of its structure. Here, by way of intro-duction, the Vice-President learned that the runway at Edwards is 15,000ft long, and lies in a flat, rock-hard dry lake 13 miles across. The runway, with overrun, had proved a blessing to a brakeless Douglas DC-8 a few days previously, and to a Boeing 720 landing without flaps the night before the visit. Neither aircraft had been scheduled to visit Edwards; passengers must consider trips to Edwards as undesirable as unscheduled visits to Cuba.

Paul Bickle, NASA Director of Flight Research at Edwards, briefed the party on the research background to the X-15 and the role played by NASA. He announced the latest X-15 figures: height, held down to 70,000ft (design 250,000ft); heat, under fuse-lage 1,000°F, wing LE 830°F (design 1,200°F); speed, M5 (design M6). He added that after 41 flights the X-15 was capable of being a much broader research tool than was seen at the beginning of the programme, and that the military services as well as NASA looked to it for many inputs for use in their space vehicles. Advanced flight-control system study for spaceflight research would be started in two weeks, and an F-104 was already flying the reaction control system to be used. Structural advances from X-15 study had proved illuminating to many designers. Advanced component research had accelerated considerably because of the X-15 and the 1,500lb of instrumentation it carried. A programme of celestial photography was planned from more than 100,000ft, using the X-15 as a camera stand, in which the Sun and planets would be seen with far greater clarity and accuracy than from the ground.

Smiling Joe Walker, NASA pilot, threw in a few facts of X-15 life during a brief film: "heart and pulse rate go up at landing, probably because there are people watching . . . now operating



Dr Donal B. Duncan (left), general operations manager of Space Systems Operations at Ford's Aeronutronic Division, and James D. Burke, Ranger project manager at JPL, study an advanced model of the Ranger spacecraft and its lunar capsule



Artist's impression of how the three-man Apollo will take-off from the surface of the Moon. During the coming decade this vehicle will probably cost more money than any other in the history of man

200 miles out of Edwards after 80 seconds boost—can come back in ten minutes, even when dropped 400 miles out . . . 3,688 miles an hour fastest yet—hope that next speed flight will take us to 4,000." He introduced, then gave credit to, Air Force pilot Maj Bob White and Navy pilot Cdr Forrest Peterson.

Talk soon travelled out of the atmosphere, to the Dynasoar and space. The particular aspect of Dynasoar chosen for a briefing was escape simulation. After the experimental workout performed at Edwards, the pilot of the Dynasoar in the operational phase would not have a large dry lake-bed to land on in the event of an aborted launch. In such a situation he would have to fly the vehicle to a runway, or eject. NASA approached the problem by pressing a Douglas F5D* into service to fly practice abort missions. NASA pilot Neil Armstrong showed Mr Johnson just how it is done, by coming in over the base at 1,000ft and then pulling up into a vertical climb at the spot marked as a Titan pad. At boost escape altitude he chopped the throttle, opened the speed brakes and then rolled out of the manœuvre to a dead-stick landing on the runway three miles away. The three miles represent the actual distance planned between the Cape Canaveral pad and the nearest runway at Patrick Air Force Base. Success of this operation with an aircraft has established that the escape rockets can be smaller than estimated, and has showed a way out of a thorny problem.

Recovery of giant boosters was very different. This speaker pointed out that water landings were excellent from the point of view of shock absorption, and absolutely necessary where parachutes are used as the recovery system. Work was progressing in the radio-controlled glider area, and here the group's attention was directed to a quarter-scale inflatable paraglider carrying a scale-model Mercury capsule. NASA's interest in the Ryan Parawing parked in the hangar was expressed, and a film showed the Parawing flying (or flapping) at 60 m.p.h. to an altitude of 2,000ft.

The pace of the presentation changed when, after inspecting an X-15 under its mother NB-52, the Vice-President's party was helicoptered over to the Edwards rocket-firing area. Here a 1,500,000lb thrust Rocketdyne F-1 engine was timed to fire shortly after our arrival. Liquid oxygen boiled off dramatically from the stand, the water system sprayed its thousands of cooling gallons and the engine failed to fire. The Vice-President had been introduced to the rocket failure club, an ignition malfunction being held responsible. Rocketdyne were taking no chances and had a second F-1 ready, this time a research version with a short 3 : 1 area-ratio chamber with an uncooled skirt to bring it up to 5 : 1. But Rocketdyne were not to redeem their failure visually, since the party moved on. The sun capital of California was reporting coastal fog at the airport, and if Mr Johnson was going to land there he would have to hurry. As the VC-137 rolled down Edwards' runway, dense black rolls of smoke indicated that the F-1 was firing.

Jet Propulsion Laboratory JPL director Dr William Pickering greeted Vice-President Johnson on October 4, presented the lab's vital statistics and then introduced Director of Lunar Programs C. I. Cummings. Cummings expressed delight—reasonable for a lunar man—at the US decision to put a man on the Moon in this decade, and then outlined the NASA programme for lunar exploration: Ranger, 9 flights, 1961-63; Surveyor, seven flights, 1963-65; Prospector, ? flights, 1966-70.

The question-mark against Prospector is related to the current emphasis on assistance and support for manned flight, which has resulted in a slight shift in the objectives of JPL programmes. Ranger, originally a five-machine programme, has been expanded to nine in order to ensure adequate lunar information for Apollo. Prospector has to take a back seat for a while, since its objectives are more closely related to purely scientific endeavour.

R. J. Parks, Director of Planetary Programs, defined his work as being twofold. The first related to unmanned exploration, and the second to developing a base for manned exploration. Two broad avenues for exploration existed: determining if any "life systems" exist in the solar system; and determining how the planets were formed. From an often-used chart he showed that going to a planet was not something you do casually, in that its position relative to Earth had to be considered. US plans for orbiting larger payloads had suffered a setback due to development troubles on the Centaur hydrogen engine made by Pratt & Whitney. These difficulties had forced JPL to abandon 1962 plans for sending a Mariner A vehicle to Venus. Instead of the 1,000lb payload of Mariner A, a Mariner R with a payload of about 460lb would be launched in October 1962 from an Atlas Agena B, the Lockheed Agena replacing the Convair Centaur second stage. Mariner R is to measure the surface temperature of Venus and transmit a spectro analysis of the planet's atmosphere. JPL scientists are naturally disappointed that the reduced maximum payload will limit instrumentation. Mr Parks touched briefly on the ability of Saturn to orbit large payloads and land a manned vehicle on the Moon, and finally suggested that an electrical propulsion system should be developed as soon as possible for missions to more distant planets.

Director of the Deep Space Instrumentation Facility E. Rechtin told the Vice-President that all was comparatively well with space communications. He spoke of the development of transmitting and receiving equipment capable of from 100 to 10,000,000,000 miles range. All these facilities are going to back the Apollo effort. International co-operation in tracking and telemetering was praised, and the Australian and South African stations used in the Mercury experiments were already working well. Aerials, both on the ground and in the spacecraft, would grow larger, and communications equipment would grow more sensitive. The TV viewing equipment for the Ranger series was expected to transmit well-defined pictures of the surface of the Moon right up to the point of impact.

After the briefing, the Vice-President and his party moved into the Spacecraft Assembly Facility to inspect the proof-test model of Ranger 1, a full-scale model of the Surveyor lunar-soft-landing craft and Ranger 3 being prepared for flight. The flood of details on the characteristics of the craft, their instrumentation, purpose, time schedule and so on snowed everybody. The party had been subjected to such a deluge of facts and figures for so long that at this point it was not hard to believe that the presentation was sailing over the heads of those being indoctrinated.

Vandenberg/Arguello The grand finale of the tour was to fly into Vandenberg Air Force Base and then proceed to Point Arguello, the US Navy's missile facility at the head of the Pacific Missile Range. The Vice-President was told that, between now and the end of 1962, NASA will launch 13 rockets over this range. The satellites will be lifted by Agena B second stages boosted by either Atlases or Thors. At the Thor Agena pad at Vandenberg there was a short briefing on the role the Thor-Agena has played in orbiting so many satellites in several programmes. NASA satellites to be launched into a polar orbit from this pad include the Canadian Defense Research Establishment project known as Topside (starting next spring); the A-12, communications satellite; Nimbus, meteorological satellite; and POGO, the Polar Orbiting Geophysical Observatory. Arguello is also the site of Atlas Agena Tiros satellite launchings.

At the Bios pad, the group was exposed to facts and figures on the biological investigation of space. Bios was defined as the second phase of the NERV programme—in fact, this pad was the site of the NERV 1 firing. Bios will use an Argo D8 four-stage solid booster to throw a General Electric 130lb package to a peak altitude of 1,100 n.m. The package will drift down by parachute for an ocean recovery, and is designed to collect data on the inner Van Allen belt, some facts about the effects of zero-gravity on small organisms and gather space particles (a package of sea urchins, bless their underdeveloped little hearts, will be in the first payload offered up to space). The party moved off into the swirling natural fog from the sea into the mystifying fog of more briefing, not forgetting to visit some concrete being poured for a new Scout pad. Four-stage Scouts will place 100lb satellites into circular orbits of approximately 600 n.m. from this pad.

The end of the tour came in the Range Operations Building, where a completely brainwashed group listened to the role that the PMR played in tracking Project Mercury and receiving telemetry signals from the Tiros weather satellite. Mr Johnson interrupted the speakers' detailed explanation to ask if the station had received forewarning of the terrible hurricane Carla, which had bowled across his native Texas before charging up the Atlantic seaboard and out to sea. It was learned that Tiros *had* forecast the storm, but that the details of the information could be best obtained from the Weather Bureau.

**Of the three prototypes, the two left flying are assigned to NASA.*

Straight and Level

NATURALLY I wish success to *Topic*, the new British news magazine. But I am bound to say that, so far as aviation is concerned, it got off to a very bad start.

In the first issue, under the heading "Air Crash Uneasiness," there appeared an article which cannot be said to live up to an editorial assurance that *Topic* will sift the world's news and interpret and explain it objectively.

The article says there were 34 crashes (the context implies that they were all fatal) in the 30 days of September. There were, in fact, seven fatal crashes. It says, also, that of the passengers killed in September, 70 were Britons who died at Stavanger and Perpignan. In fact, neither of these accidents took place in September. One was on August 9 and the other was on October 7. Again, the Air Ministry is referred to instead of the Ministry of Aviation; and, to cap it all, the page on which the article appears is dominated by a large picture of the Falcon Airways Hermes that over-ran the runway at Southend a year ago—an accident in which no one was hurt, and the cause of which (aquaplaning) was not due to any fault of the operator.

Topic's first article about aviation was, to say the least, unfortunate.

● The American Air Line Pilots Association, I read in *Aviation Daily*, insisted during recent negotiations with Southern Airways on the deletion in the company manual forbidding married pilots from dating stewardesses. The US pilots union said that this must be deleted before negotiations could proceed.

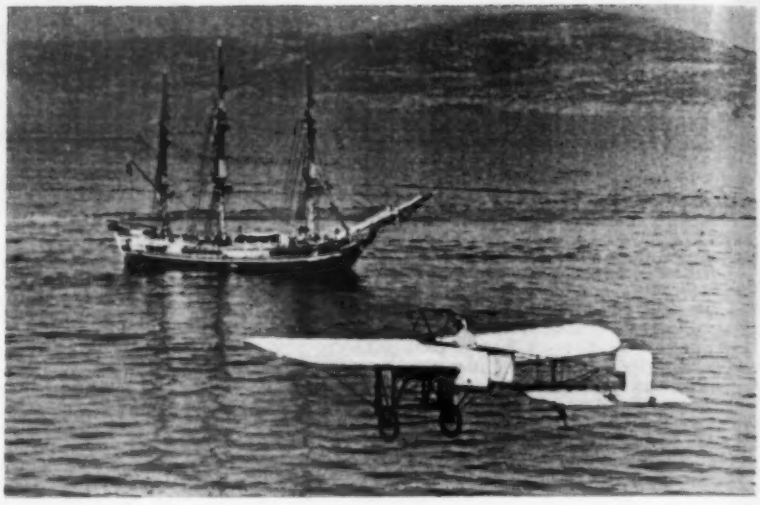
"*Who was that Southern Airways stewardess I saw you with last night?*"

"*That was no Southern Airways stewardess, that was a Southern Airways female enforcement officer in disguise.*"

● Having been pilloried by the historical nitpickers, I don't want to get myself known as a winklepicker. But I can't help picking on the redoubtable "Winkle" Brown, whose book, *Wings On My Sleeve*, has just been published by Arthur Barker Ltd. A colleague who has read it assures me that it is one of the best for years; and it has some amazing pictures of Cdr Brown's historic landings on the flexible deck, and others of him taking off in a Seafire with the catapult trolley still attached.

But I believe the following to be the sheerest fantasy: "... Initially the defending Me109s and FW190s took heavy toll of the Forts. Then the Americans introduced two-seat, long-range versions of the Thunderbolt and Mustang to give them escort cover. Each fighter carried two pilots. The pilot in the rear cockpit flew the machine to the target area, and handed it over to the front pilot for combat. They were so successful in keeping off the 190s and 109s that the bombers began to achieve alarming results. The 163 was the countermeasure."

Now, honestly, *am* I a winklepicker? But I hope that Cdr Brown's book will enjoy success.



Capt Bligh: Run out the stern-chaser, Mr Christian!
M Blériot: Hélas! Encore les indigènes sont hostiles!
Actually (it says here) this glorious picture shows Cdr Frank Tallman simulating the first aerial crossing of the English Channel in his 1910 Blériot monoplane as a replica of HMS "Bounty" returns to California from film location work in Tahiti

● I wonder if there is another reason behind Cunard's decision—obviously backed to the hilt by the Government—not to go ahead with plans for the new *Queen*.

It can't be that Cunard and the Government have suddenly seen the sense of all the criticisms. I have an idea that one reason for this climb-down might well be that Cunard Eagle are going to get their North Atlantic air service licence.

● An eminent member of the British aviation industry has written to me about my recent remarks on the subject of backward-facing seats. He believes that the Air Registration Board would agree that backward-facing seats are safer; but, he says, the ARB insists that backward-facing seats shall be stressed to 9g. Meanwhile, for forward-facing seats, the Board permits 6g.

The Board argues, however, that 6g is not enough, and that all seats should be stressed to 9g or 12g—or higher. The Board cannot ask the airlines to scrap all their forward-facing 6g seats and replace them with 9g seats, but says that anyone who wants to fit backward-facing seats should have them stressed to 9g.

In other words, an airline installing one safety feature (backward-facing seats) is automatically burdened with a second safety feature (9g seats). My correspondent feels that the ARB's attitude is illogical, and that he personally would prefer to sit in a 6g seat facing backwards rather than forwards. He feels, as I do, that most passengers would agree.

● In Sydney last week Sir Matthew Slattery, chairman of BOAC, predicted that the corporation would have a deficit during the current year of some £8m.

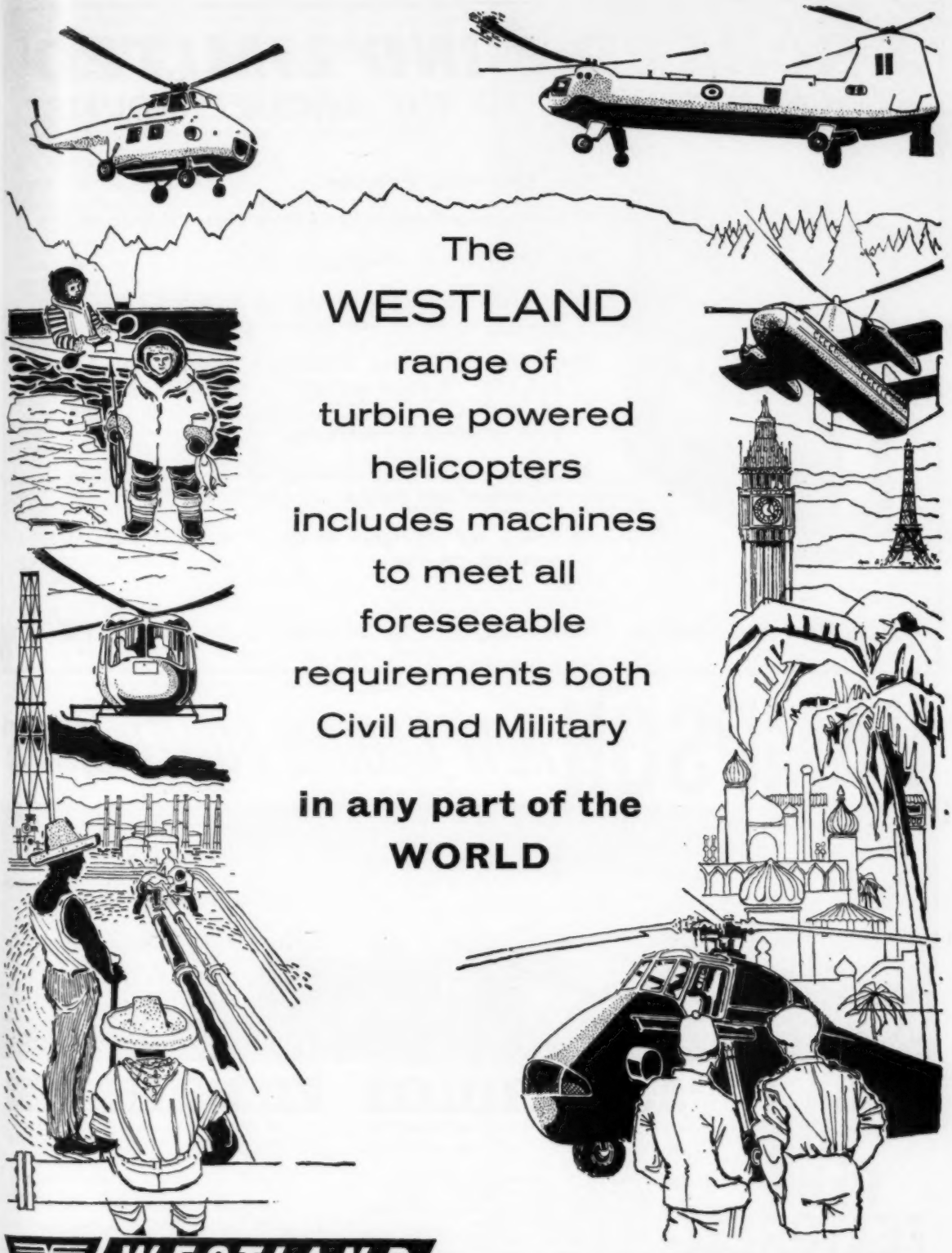
I can tell him where perhaps £50 of that £8m went, on the assumption that the price of lawn turfs is £3 per 100, and that turf-laying labour costs are 6s 6d per hour.

The other day I saw, in front of the BOAC headquarters at Heathrow, BOAC gardeners laying a 250 sq ft lawn. At the same time, 150 yards away, a building contractor's bulldozer was ploughing up perfectly good grass.

It's only a little thing, I know. And it may well be that the people responsible for budgetary control in BOAC observed these goings-on. I hope so, because lots of little things like this can run away with much more than £50.

● "A DC$\frac{3}{4}$6 ... will be the first Sabena plane to land at Elisabethville since fighting started ..." *The Guardian.*

ROGER BACON



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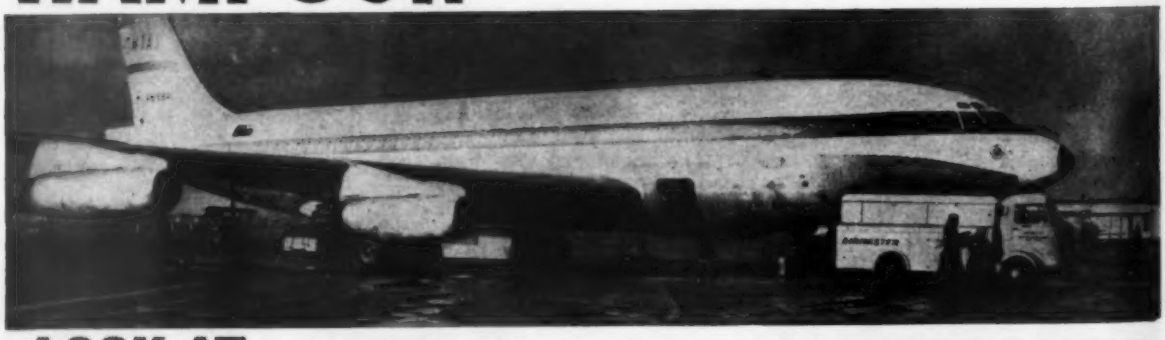

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Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

From 1920 . . . to P.1127

IN your editorial of October 5 you referred to the important book by Mr Mason, *Hawker Aircraft Since 1920*, and I must say how much I enjoyed reading about the astonishingly large number of types of aeroplanes produced by Hawker, some of which I had never heard of and some of which could only just be remembered.

With regard to test pilots' records, however, there are one or two minor inaccuracies, one of them having already been acknowledged graciously by Mr Mason to me personally—to wit, my premature decease. I am hoping to make capital out of this in my dealings with the Commissioners of Inland Revenue and look forward to some heartening rebates since 1939.

At the same time I must admit that of the three aircraft types I am reported to have test flown, two are mentioned inside whose cockpits I have never been. Moreover, my old friend John Crosby-Warren was not killed in a Typhoon, but by an early version of the Gloster Meteor with experimental ailerons.

I am sure Mr Mason has been to great trouble to check his facts, and my real regret is that the records of test pilots are kept in such a casual way, whilst those of machines are not.

Chesham, Bucks JOHN GRIERSON

Locating London's Heliport

YOUR recent reports as to the attitude of the Westminster, Battersea and Lambeth Councils to the proposed building of London's International Heliport at Nine Elms make one wonder just what peculiar characteristic of the British people causes them to continue to be just so far behind the times. It would even appear that this is another example of a peculiar trait of the British in always resisting to the very last any modern innovation or transport development. Our present economic position is an example of this lack of foresight and forward planning, and resistance to modern techniques and methods.

Westminster City Council, together with Battersea and Lambeth Borough Councils, are reported to be resisting to the last the Ministry of Aviation's plans to construct an international heliport at Nine Elms.

London is the only major international city without a city-centre heliport and just cannot afford to continue to procrastinate on this problem whilst other nations are rapidly developing city-centre services.

How is it that the citizens of Brussels, Rotterdam, Paris, New York, Chicago, Los Angeles, etc, etc, who are just as susceptible to "intolerable noise," are not suffering in any way from the completely "intolerable noise" alleged by the worthy councillors of these three London boroughs.

In any case, perhaps the same worthy councillors do not know that many helicopters are daily passing through the air above their respective boroughs, due to the fact that helicopters proceeding to and from the present Battersea Heliport cross London along the course of the River Thames. Has Westminster Council received numerous complaints caused by helicopters operating regularly into and out of the grounds of Buckingham Palace?

The selfish attitude adopted by certain London [boroughs in this respect defies understanding. If taken to a logical conclusion, the apparently only acceptable locations for a heliport for the British Isles would appear to be the middle of Dartmoor or the middle of the North Sea.

There is no point whatsoever in having helicopter travel at all if advantage cannot be taken of the helicopter's ability to operate into and out of city centres. Let us be realistic about this. Of course, there will be some noise, but Central London is already full of noise from numerous railways, stations, shipping and traffic. One would have thought that this country would have already learned its lesson 100 years ago when the railways came. Many cities and towns owe their current prosperity and position to the railways, others have lost ground. Northampton is an example, as no main line railway serves the town, the main line having had to miss the town due to local objections at the time of construction.

The Nine Elms site is in any case probably the finest possible site in Central London, as it is surrounded by a mass of railway yards on three sides and the Thames on the other.

London W1 HENRY M. BERNEY
Director, Rotorports Ltd

Védrines' Caudron biplane on the roof of Galeries Lafayette in Paris (see letter from Mr Claud Powell). In this photograph it is not seen at the end of its landing run, but in the position to which it was subsequently moved so that it could be seen from the street. The sandbag surface, according to a "Flight" caption at the time, was "to give protection against Hun bombs"

STOL in 1919

RECENTLY I was consuming a temperance beverage in the café on the roof of the Galeries Lafayette in Paris and noticed there a small memorial stone with an inscription to the following effect:—

> "On the 19th January 1919 the airman Jules Védrines achieved for the first time the landing of an aircraft on the roof of a building in a big city, on this terrace."

Has *Flight* any details or photographs of this remarkable performance?

London SW7 CLAUD POWELL

[Yes, indeed; two photographs depicting the incident were published on January 30, 1919, and one is reproduced above—Ed.]

FORTHCOMING EVENTS

Oct	26	Institute of Transport (London): "Development of New Aircraft and their Testing," by Sqn Ldr H. G. Hazelden.
Oct	30	RAeS Historical Group: Lecture by Sir Frederick Handley Page.
Nov	1	RAeS (Joint meeting with Institution of Electrical Engineers): "Generation of Power in Satellites," by H. J. H. Sketch.
Nov	1	Royal United Service Institution: "Thoughts on the Nuclear Deterrent," by Marshal of the RAF Sir Dermot Boyle.
Nov	3	RAeS Rotorcraft Section: "Electronic Flight Information Displays for the Rotary-wing Aircraft," by Wg Cdr J. C. G. Bell.
Nov	9	Radar and Electronics Association: "Space Communications" (Part 2), "Orbits and Their Economics," by W. F. Hilton.
Nov	10	British Interplanetary Society: "Photography from Rockets and Satellites," by R. Hall.
Nov	14	RAeS Astronautics and Guided Flight Section: "A Comparison of the Control Problems of Missiles and Manned Aircraft," by K. W. Smith.
Nov	15	Royal United Service Institution: "Amphibious Warfare in the Late 1960s: Seaborne/Airborne Operations," by Maj-Gen J. L. Moulton.
Nov	16	RAeS: Seventeenth British Commonwealth Lecture, "The Progress of BEA and of European Air Transport 1946-61," by Lord Douglas of Kirtleside.
Nov	17	RAeS Man-powered Aircraft Group: "Aerodynamics of Man-powered Aircraft," by T. R. F. Nonweiler.
Nov	17	Institute of Navigation: "The Navigation and Guidance of Supersonic Aircraft," by Capt William L. Polhemus.
Nov	21	RAeS: "Military Ground Effect Vehicles," by W. H. Coulthard.
Nov	22	RAeS Graduates' and Students' Section: "Army Aviation," by Col C. D. S. Kennedy.
Nov	22	British Interplanetary Society: Symposium on "Materials for Space Technology."
Nov	23	RAeS: "Flight Characteristics of the B-58 Mach 2 Bomber," by B. A. Erickson.
Nov	24	RAeS Graduates' and Students' Section: Winter Dance.
Nov	27	RAeS Historical Group: "The Society's Library and Aeronautical History," by F. H. Smith.
Nov	28	Institute of Transport (West Middlesex Group): "A Pilot's View of Air Transport," by Capt O. P. Jones.
Nov	29	Society of Environmental Engineers: "The response of Dynamic Systems to Shock Excitation," by B. H. Venning.
Nov	30	Guild of Air Pilots and Air Navigators: Professional Licence Holders Meeting, Annual Service and a.g.m.

RAeS Branch Fixtures (to Nov 2): Oct 26, *Bristol*, "Development of Para Visual Director," by R. A. Chorley; *Christchurch*, "Navigational Aids," by F. H. Bevan; *Gloucester*, "History of Silver City Car Ferry Operations," by M. D. Day.

Clean exterior design characterizes the Mk 5 Jetstart (see news-item)

THE INDUSTRY

DSIR Council Members

FIVE new members of the Council for Scientific and Industrial Research have been appointed by the Minister for Science, Lord Hailsham. They are Mr L. H. Bedford, CBE, MA, FCGI, MIEE, MBIRE, FIRE, FRAeS, director of engineering, guided weapons division, English Electric Aviation; Mr G. B. R. Feilden, MA, MIMechE, FRS, managing director, Hawker Siddeley Brush Turbines; Prof E. R. H. Jones, DSC, FRIC, FRS, Waynflete Professor of Chemistry, Oxford University; Prof O. A. Saunders, DSC, MIMechE, FInstP, FInstF, FRAeS, HonFCGI, FRS, Professor of Mechanical Engineering, Imperial College, London; and Mr H. C. Tett, BSC, DIC, ARCS, FInstP, AMIMechE, chairman and managing director, Esso Petroleum.

Stored-air Starting

IN *Flight* for August 26 last year we described in some detail the range of stored-air aircraft-starting equipment marketed under the name Jetstart. The makers—I.V. Pressure Controllers Ltd, of 683 London Road, Isleworth, Middx—have recently released new details about the latest trolley unit in the range, the Jetstart Mk 5. This equipment, which provides a source of high-pressure air controllable to fine limits, is capable of starting four engines by supplying each with 80lb of air at 60°F, 45lb/sq in gauge for 25sec.

The air supply comes initially from 24 Chesterfield bottles with a total capacity of 21 cu ft. Working pressure for each bottle is 3,600lb/sq in gauge (tested to 6,000lb/sq in).

When brought into operation, the initial pressure can be controlled down to a final 300lb/sq in. Condensate can be drained from the bottles through a valve at the rear of the unit.

A maximum of 3,600lb/sq in is available from the high-pressure distribution panel and a regulator-controlled 5–750lb/sq in from the low-pressure source. Air both entering and leaving the unit is filtered to 25 microns.

Should a sudden surge of air cause internal pressure to rise above the pre-set maximum, a spring-controlled poppet valve, with variable settings from 1,300 to 4,000lb/sq in, gives the necessary relief. Other spring-loaded relief valves, with settings variable from 10 to 150lb/sq in, are fitted to the high-pressure bottles.

The Jetstart is mounted on a four-wheeled trolley with steerable front wheels which are automatically braked when the tow-bar is allowed to fall into the parking position. The unit is 60in high and, excluding tow-bar, 101in long. Weight fully loaded is 2.5 tons.

Space is available within the unit for a heat-exchanger should one be required.

New Castrol Directors

THREE new directors, Messrs L. Colkett, K. C. McCarthy and G. H. Thornley, have been appointed by Castrol Ltd, parent company of the Castrol Group.

Mr Colkett joined the company in 1934 and became secretary of Castrol Ltd (then C. C. Wakefield & Co Ltd) in 1955; Mr McCarthy joined Castrol in 1930 and after several years in the publicity department transferred to the motor oils department as assistant manager, being made sales promotion manager of the Castrol division in 1956: he is to become general manager of this division on January 1 next year; Mr Thornley, who joined Castrol 36 years ago, has been group technical manager since 1951.

Electronics Directory Amendments

THE directory of principal manufacturers of electrical and electronic equipment in *Flight* for October 5 noted that **Lucas Gas Turbine Equipment Ltd** make electrical accessories and ignition screen harness. The entry, however, should more correctly have read "Research, design, development and manufacture of fuel pumps and associated control systems, combustion equipment, space and anti-icing heaters, fuel boost-pump systems, hydraulic motors and pumps for aircraft and guided missiles."

The list should also have included **Rotax Ltd,** well known as manufacturers of a wide range of electrical equipment of all types, including AC and DC generating and starting systems, motors and control equipment.

* * *

Westinghouse Brake & Signal Co Ltd, of 82 York Way, London, N1, point out that their electronic products listed in the above-mentioned directory should have included the following: silicon-controlled rectifiers, silicon diodes and selenium rectifiers for aircraft; transformer/rectifier units and control circuits; and mains-operated ground services equipment.

* * *

The same review included, *inter alia*, the names of a number of manufacturers of batteries. To these should be added **Cadmium Nickel Batteries Ltd,** Spedant Works, Park Royal Road, London NW10, who inform us: "We have supplied some thousands of batteries through Ministry of Aviation contracts for stand-by operation of UHF sets. We have also supplied, through the same agency, a large number of batteries of different shapes and sizes for missile and potential space applications. These are, of course, in addition to our normal supply of main aircraft batteries."

IN BRIEF

Mr E. G. Barber, BSC, AFRAeS, has been appointed group education officer for British Aircraft Corporation. Since 1954 he has been education officer of Vickers-Armstrongs (Aircraft) Ltd.

Mr Derrick R. Black, 15 Bushey Road, Ickenham, Middx, is now specializing as a freelance film adviser and production executive to the aviation industry. During the past three years he has worked on several films for international airlines, including BOAC, and recently wrote a film script for Air-India International.

Mr Cecil Field, manager of the Aviation Department of Shell-Mex & B.P. Ltd, is to retire on October 31; he will be succeeded as manager by Mr Edward Trees, at present assistant manager (sales) of the department. Mr Trees, who joined Shell-Mex & B.P. in 1956 after 14 years' service in the RAF, is 37.

Rear Admiral J. Y. Thompson, CB, has joined Elliott Brothers (London) Ltd, and is to assume special responsibilities in connection with the company's work for the Royal Navy. He commanded the aircraft carrier HMS *Unicorn* in the Korean War and was subsequently Director of the Gunnery Division of the Naval Staff and latterly Admiral Superintendent of Chatham Dockyard.

Board changes in unit companies of the Turner & Newall group—Turner Brothers Asbestos Co Ltd, Ferodo Ltd and Glass Fabrics Ltd—have been announced. Mr J. Waddell, executive director of Turner Bros and Glass Fabrics, has been appointed managing director of each company; he continues to be executive director of J. W. Roberts Ltd. Mr E. R. Pochin, home sales director of Ferodo, has been appointed managing director of that company; he is succeeded as home sales director by Mr M. H. Good, formerly home sales manager.

ARRIVING AT IDLEWILD: Three senior executives of Ultra Electronics, who are visiting US companies, including those with whom (as reported in "Flight" for October 12) Ultra have technical agreements. L to r: Mr A. V. Edwards, managing director; Dr F. W. Stoneman, executive director, sales and engineering; and Maj-Gen E. S. Cole, newly appointed managing director, telecommunications division

SERVICE AVIATION

Air Force, Naval and Army Flying News

The Duchess of Gloucester with the AOC-in-C, Transport Command, Air Marshal Sir Denis Barnett, during her recent visit to RAF Lyneham. Behind the Duchess is the station CO, Gp Capt I. D. Lawson

AOC and AOA

TWO Air Officer appointments have been announced: AVM P. H. Dunn, CB, CBE, DFC, is to be AOC No 1 Group, Bomber Command, from December 1; and AVM H. H. Chapman, CB, CBE, is to be AOA, Maintenance Command, from December 5. AVM Dunn has been Deputy Air Secretary at Air Ministry since May 1959; from 1953 to 1958 he was an ADC to the Queen. AVM Chapman has been Director-General of Technical Services since October 1958.

Stretching the Regulations

A WHIRLWIND from the 22 Sqn detachment at RAF Chivenor flew 1hr 25min in darkness *en route* from Plymouth to Birmingham on October 21 to convey a woman suffering from a heart ailment to the Queen Elizabeth Hospital for special treatment. Pilot of the helicopter, which left Plymouth at 1740hr and reached Elmdon (Birmingham Airport) at 2010hr, was Flt Sgt R. L. Turner; his navigator was Flt Lt J. Mitchell. A spokesman at the rescue co-ordination centre at Plymouth was quoted as saying: "Flight conditions were very bad. Service helicopters do not usually fly at night, but as this was a matter of life and death regulations were stretched." There were three passengers aboard the Whirlwind, the sick woman being accompanied by a doctor and nurse.

Argosies at Benson

IN preparation for the formation there early next year of the first Whitworth Gloster Argosy squadron, No 114, big changes are taking place at RAF Benson. A new control tower has been completed, and a new hardstanding, with parking space for 21 Argosies (the station is eventually to contain three squadrons). One reason why Benson was chosen as an Argosy base, say Air Ministry, is that the airfield had already been scheduled for the installation of automatic landing systems. A new electronics centre is due to be completed next February, and the station will have an Argosy simulator.

Formation of 114 in its new role will be preceded by the formation at Benson of an operational conversion squadron. Previously based at RAF Colerne, Wilts, No 114 were then equipped with Hastings. Their aircraft have been divided between the two other squadrons there, Nos 24 (Commonwealth) and 36.

RAF Monoplanes' Quarter-century

A QUARTER-CENTURY of monoplanes in RAF service is being achieved next month, for it was in November 1936 that Royal Air Force's first all-metal low-wing cantilever monoplane—the Fairey Hendon—entered service with 38 Sqn at Mildenhall. This marked the real changeover from biplanes to monoplanes, although a few types of monoplane had been in service in earlier days—the Bristol Monoplane in the First World War, a dozen D.H. 53 Humming Birds in 1924 for experimental work, some Puss Moths in the 1930s for communications duties.

Gen Laurence Kuter, NORAD C-in-C, with Air Marshals Sir Kenneth Cross (centre) and Sir Wallace Kyle during Exercise Skyshield II (this page, last week) in which RAF aircraft flew

In March 1936 the Avro Anson entered service, but the Hendons marked the general introduction of heavy monoplanes into the RAF. Although the Spitfire and Hurricane prototypes had already flown, current fighters and bombers—such as the Gauntlet, Fury, Demon; Hinds, Gordons, Heyfords—were biplanes.

IN BRIEF

RAF Wattisham won this year's Fighter Command photographic competition for the second year in succession. RAF Stradishall were second and RAF Chivenor third.

Sir Bertram Hyde Jones, KBE, who at the request of the then Air Minister, the first Viscount Rothermere, undertook with the late Sir Arthur C. Roberts the financial and other arrangements for the merger of the RNAS and RFC into the RAF, died at his home near Cape Town recently at the age of 82.

This year's 79 (FR) Sqn reunion will be held at the Talbot Hotel, Stow-on-the-Wold, Glos. There is to be a dinner at 8 p.m. on Saturday, November 18, and luncheon the following day at 2 p.m. Further details from Flt Lt M. A. P. Pugh, Officers' Mess, RAF Little Rissington, Cheltenham, Glos.

92 Sqn are holding a reunion dinner at the Cumberland Hotel, Marble Arch, London W1, on Saturday, November 18. Past and present members who can attend will be most welcome. Names and addresses should be sent to the Adjutant, No 92(F) Squadron, RAF Leconfield, Beverley, E Yorks.

The Minister of Defence, Mr Harold Watkinson, told a questioner at the Conservative Party Conference that trials and development of Blue Steel were going very well; the weapon was expected to come into service soon. Referring also to Skybolt progress, he said "we hope by these means that we shall keep up the valid and important British contribution to the strategic deterrent over the next eight to ten years."

Pakistan Air Force visitors: at right below, the C-in-C, Air Marshal Asghar Khan, handing to the CAS of the RAAF, Air Marshal V. E. Hancock, in Canberra, a plaque of the official crest of the Pakistan Air Force. At left, Air Marshal Sir William MacDonald, AOC-in-C, Near East Air Force, greeting Gp Capt E. G. Hall, Assistant Commandant of the Pakistan Air Force Staff College, when members of the college paid a five-day visit to the RAF in Cyprus

The Irish and Welsh airlines, whose senior officials are seen together at the opening of Cork Airport last week, are partners in the new services linking Cork with Cardiff, Bristol and London. Second from left, Mr J. Morgan, chairman of Cambrian Airways; Mr J. F. Dempsey, general manager of Aer Lingus; Mr P. Lynch, chairman of Aer Lingus; and Wg Cdr L. B. Elwin, managing director of Cambrian Airways

"Flight" photographs

AIR COMMERCE

IRELAND'S NEW GATEWAY

IRISHMEN rightly think of Aer Lingus as the symbol of modern Ireland, and Corkmen, indeed all Irishmen, are especially proud of Cork's new £1m airport. Among the passengers on one of the first aircraft to land there—an Aer Lingus Viscount—on the morning of Monday, October 16, was the Prime Minister himself, Mr Sean Lemass. "This new airport," said the Taoiseach, "symbolizes Ireland's purpose, and it will help us in our desire to have the world see us as a modern progressive state, coming rapidly and fully into line with all others in modern equipment and facilities."

Flight accompanied the inaugural Aer Lingus London - Cork service which arrived at the airport during the day, and which was followed a few minutes afterwards by a DC-3 of Cambrian Airways from Bristol and Cardiff. The Irish and Welsh airlines are operating services between Cork and London, some direct and others *via* Bristol and Cardiff, "in association" with each other, though not in pool. Attending the inaugural celebrations were Cambrian's chairman, Mr J. Morgan, and the managing director, Wg Cdr L. B. Elwin. Needless to say, the top people of Aer Lingus, including the chairman, Mr P. Lynch, and the general manager, Mr J. F. Dempsey, were present also.

Cork, with a population of about 120,000, is Ireland's third largest city, and its new airport is a gateway to some of the most beautiful coastal scenery and countryside in the world. (It is now possible, indeed, to kiss the Blarney Stone only 40 minutes after arriving in Ireland!) Hitherto, air visitors to the tourist resorts of southern Ireland have had to travel *via* Dublin or Shannon and thence by rail or road to their destinations. The new airport will give a real impetus to local tourism, and it will also benefit the expanding industrial economy of Cork.

The airport was due to have been opened last June, and much work even now remains to be done; the main 6,000ft ILS runway 17/35 (north-south) is in use, but the secondary 4,300ft runway 07/25 (east-west) is not yet quite ready. Considerable work needs to be done to complete the interior of what is obviously going to be a most attractive terminal building, with all the latest airport mod. con.; and the 80ft high air traffic control tower, an impressively attractive example of modern airport architecture, is still not fully equipped. But it is hoped that all the facilities at the airport will be ready in time for the start of the summer 1962 season.

Above and below, aircraft of the first two airlines to inaugurate services to Cork's new airport are seen in these pictures of the impressive 80ft control tower. Viscounts will operate only a few initial services on the Cardiff - Bristol - London route, being superseded from November 1 by Friendships. A diagram of the airport's layout appears on page 670

The airport is only four and a half miles from Cork itself, and is located on the top of a 500ft plateau to the south of the city. The site has a good weather record, albeit a windy one (gusts of up to 47kt were recorded on the day following the inauguration, through of course the two right-angled runways should alleviate crosswind problems). The main 6,000ft runway is suitable for Aer Lingus's Boeing 720s when these are operating light, though the airline at present has announced no plans for operating jets into Cork. Navigational and landing aids, in addition to ILS on the main runway, comprise VOR and NDBs. It is hoped to install GCA and visual glide-path indicator lighting in due course.

Capacity of the airport is aimed at an eventual 100,000 passengers a year, with 40,000-50,000 a year expected during the first few years. Among the other airlines having operating rights to Cork are: Derby, who hope to operate a regular Derby - Birmingham - Cork service from about next Easter; Jersey Airlines, who intend to operate from the Channel Islands in the near future; East Anglian, who plan to operate a car ferry from Bristol if they get ATLB permission to carry supplementary passengers; Starways, who have rights from Liverpool; and BKS, who have plans to operate from Leeds/Bradford and Newcastle.

Although some initial services will be operated with Viscounts, Aer Lingus will operate Friendships between Cork and London in association with Cambrian Airways' DC-3s. It remains to be seen how competitive the DC-3s will be with the Friendships. The DC-3 schedule for the nonstop London - Cork service is 45min longer than the 1hr 45min of the Friendship, which also of course has greater passenger-appeal. It is interesting that BEA are not the designated British carrier on this potentially valuable new international route. Clearly there can be no great independent *v* corporation conflict here, Cambrian being an independent in which the corporation has a shareholding (33 per cent). Obviously BEA have sized up the potentialities of the London - Cork route; and their decision not to participate could well have been based on the fact that, in the first few years at any rate, traffic will be too thin to justify the scheduling of Viscounts on what is essentially a Friendship/DC-3-sized route. BEA will have Heralds soon, but these are for deployment on Scottish services.

The Aer Lingus/Cambrian London - Cork joint schedules provide, from November 1, two return flights between the two cities every day except Sundays. Direct services will operate on Mondays, Thursdays, Fridays and Saturdays, while additional flights, serving either Bristol or Cardiff *en route*, will operate every weekday. Fares will be £18 15s tourist return, or £16 2s 17-day excursion. Aer Lingus are also operating direct Friendship flights from Cork to Paris, and on the domestic route to Dublin.

Photographed recently in Bermuda was one of the two Comet 4Cs leased by Mexicana to Guest, who operate services from Mexico to Lisbon, Madrid and Paris via Miami and Bermuda. As recently reported, financial difficulties may cause Guest to suspend its Atlantic services

"Flight" photograph

The Board's First Report

WITHIN a few days of the Air Transport Advisory Council's last report, reviewed in last week's issue, the Air Transport Licensing Board's first report* appeared. This apparent anomaly—since the Board was appointed by the Minister on October 1, 1960, and the report covers the Board's activities only up to March 31 this year—is justified by the advantages of regarding the Board's year as ending, like that of most of the industry, on March 31.

The report records "a deep sense of personal loss" at the death of Lord Terrington on January 7; Lord Terrington had been chairman of the ATAC since its inception in 1947, and was the Board's first chairman. Commenting that a successor was not appointed during the period covered by the report (Professor D. T. Jack's appointment was from April 1, 1961), the report remarks: "It is regrettable that this delay left the Board without the guidance of a permanent Chairman during the important formative period of our existence."

Pointing out that the Act does not provide any positive guidance on policy for the Board to follow, the report says: "It appears to have been the intention of the legislature to leave the Board unfettered as regards the general policies they should pursue and, in particular, free to exercise their judgement with no predetermined preference for any particular classes of air transport operator or particular class of service."

It is also worth noting that the Board, through Section 4 of the Act, carries on the "consumers' council" functions of the ATAC which, in its last annual report, commented that the public had hardly made any use of it at all as a channel for complaints.

On the financial status of operators, the report points out that, in issuing transitional licences on the Minister's direction, the Board was unable to examine the financial standing of the operators; and early applications for licences likewise had to be dealt with before the Board was able to complete the considerable task of examining balance sheets, profit and loss accounts, etc. The grant of licences for services to be operated in the near future must, in most cases, rest upon a more perfunctory examination of finances than will be made later on, says the report.

The report expresses "some concern" at the number of cases where, through so-called "errors," passengers have been booked for services which had not yet been licensed or bookings made in excess of the capacity authorized. Applications for licences to cover such over-bookings—sometimes a few days before the passengers are due to travel—place the Board in the unpleasant position of granting the licences without regard to their merits and without giving interested parties a chance to be heard, or of refusing the licences at grave inconvenience to the travelling public. "A licensing system cannot operate fairly under duress," says the report, "and we shall be most reluctant to grant licences where an applicant has anticipated our approval by taking bookings." The report suggests that it would be "very much in the public interest" if tour organizers made a habit of naming the airline and, where practicable, the type of aircraft that will carry their passengers.

The examination of operators' insurance arrangements, like that of their financial status, could not be done while issuing transitional licences, nor could a full examination be allowed to delay current licence decisions, many of which are urgently awaited. But although the Board has not so far expressed any dissatisfaction with the insurance cover of any application for a licence, they may well do so when they have made further progress with the examination of operators' arrangements in this respect. The report comments that major accidents involving British aircraft are rare, and the Board was not aware of any case where the victims have not been compensated in full because of inadequate insurance. This indicated the general adequacy of the insurance cover taken out, and that insurers interpret their obligations liberally, as well as a high standard of safety in operation having been achieved.

* *H.M. Stationery Office, price 1s 3d.*

BEA's ARGOSY PLANS

NOVEMBER 6 is the date on which BEA is due to take delivery of the first of its three AW.650 Argosies; the second is due to be delivered on November 18, and the third on December 20. The first BEA scheduled Argosy service will be between London and Milan, and is set for November 26.

Five BEA training captains have completed the classroom part of their Argosy conversion at the manufacturer's Baginton factory, where this week they are due to start their flying training. When the first aircraft is delivered on November 6 the training of 28 BEA Argosy pilots (all ex-Viscount) will begin at Stansted. Each will have completed his classroom training in the corporation's Viking Centre training establishment near London Heathrow.

Occupying the co-pilot's seat in a Friendship during a recent flight over the Ijsselmeer is the British Ambassador in The Hague, Sir A. N. Noble. His Excellency toured the Schiphol factory accompanied by BEA's man in the Netherlands, Mr William Hatch

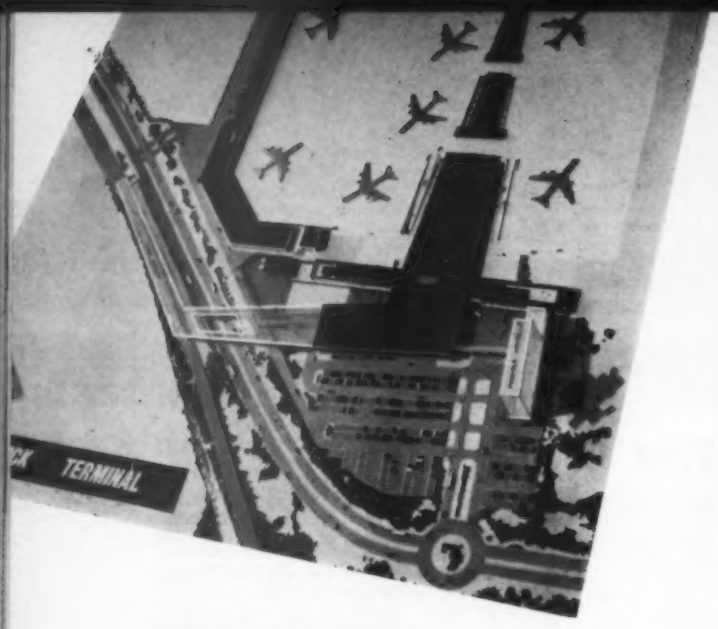
BEA has specified a cockpit layout for the Argosy which is much the same as that of the Viscount, and conversion of ex-Viscount pilots to the aircraft is likely to be straightforward. Indeed, operationally, the Argosy flight will be merged with BEA's No 3 Viscount flight.

On November 27, the day after the inaugural scheduled service to Milan, a twice-weekly service between London and Jersey will be opened, followed on November 28 by a twice-weekly service between London and Paris. Just over a month later, on January 2, there will be six services a week to Frankfurt, each of which will call at Düsseldorf on the way back to London. On January 7 a twice-weekly service to Manchester will be opened, followed on January 8 in a thrice-weekly service to Glasgow *via* Manchester. On January 30 a six-times-weekly service between London and Copenhagen will start.

JERSEY TO BE INDEPENDENT

BEA is to relinquish its 25 per cent holding in Jersey Airlines. In a joint statement on this change of policy, Lord Douglas of BEA and Mr M. L. Thomas, chairman and managing director of Jersey Airlines, say:

"Following the introduction of the Civil Aviation (Licensing) Act, 1960, it has become increasingly evident to both parties that a review of policy is necessary in order to avoid the possibility of any conflict of interest inherent in a shareholder being also a competitor. It has now been agreed that it would be to the advantage of both concerns that BEA should dispose of its shareholding.



Prestwick is to have a new £1¼m terminal, due to be opened in August 1963. A unique feature is that the railway, car parks and passenger accommodation will be approximately 8ft below the apron level. The terminal will be large enough to cater for the expected traffic in 1968, when it is estimated that 600,000 passengers will use the airport. The first part of the new apron is already under construction. Initially twelve aircraft stands are provided

AIR COMMERCE...

BRANIFF ORDERS ONE-ELEVENS

BRANIFF International Airways has placed a firm order for six BAC One-Elevens with an option on another six, and thus becomes the first major American airline to order a foreign airliner "off the drawing board." The bare facts behind the order are that deliveries of the first six are to begin in October, 1964, and to continue through the first quarter of 1965, while the value of all 12 One-Elevens is approximately $35m (£12½m) including spares.

Behind these facts can be discerned a trend of great potential importance to the British industry, for Braniff is the third major US carrier in the last two years to order jets from Europe. Like United and TWA when they bought Caravelles, it had never bought non-American equipment before. And unlike United and TWA, who had sponsored such important types as the Boeing 247, the DC-2, the DC-6 and the Constellation, Braniff has always relied on off-the-shelf as distinct from sponsored or "off the drawing board" orders to maintain its competitive position. Its selection of the One-Eleven three whole years before the type is due to be delivered (and without having any background of Viscount operations to predispose its choice) is a gratifying tribute to BAC. The Braniff order, together with the interest in the One-Eleven shown by such carriers as Ozark and Frontier, shows that the traditional American reluctance to buy non-American equipment is beginning to crumble rapidly.

It has been known for some months that Braniff has been in the market for a Convair 440/340 replacement; the airline was reported to have been interested in the Avro 748, and before that consideration had been given to re-engining the Convairs (Braniff has six 440s and 25 340s) with Allison 501-D13 turboprops. Mr Charles E. Beard, president of Braniff, said of his new order: "After devoting more than a year to comparative analyses, it is our conclusion that the BAC One-Eleven is the short-range jet best adapted to the routes on which we plan to operate them. The economy of the BAC One-Eleven, combined with its operating characteristics, make it unusually suitable for an operator with our kind of route, over which most of the flying is on segments of 250 miles or less. We already have the large jets for the longer hauls. The BAC One-Eleven will bring economical and comfortable jet travel to the customers who make the shorter flights."

Sir George Edwards said of Braniff's choice: "Their reasons for choosing the One-Eleven may well read across to a number of other airlines now studying the idea of a 'second jet' to serve all the routes below those operated by their large jets. This has always been one of the major roles foreseen for the One-Eleven. There are already firm indications that before long there may be further orders for One-Elevens, including some from the United States."

CAA's GOOD YEAR

ALTHOUGH the profitable Zambezi Viscount services to the UK were withdrawn in October 1960, due to the introduction of Skycoach services, CAA made a profit for the year ending June 30, 1961, the airline operating without state subsidy for the second year running. Declaring a net operating profit of £127,032 Mr R. M. Taylor, CAA's chairman, said that the programmes and the budget for the year ahead envisaged no subsidy requirements. He also said that in considering the profit figure it should be appreciated that the airline had created two reserves totalling £150,000 as a safeguard against the increasing cost of replacing assets. The profit for 1959-60 was £72,751.

On the financial front the carrier earned revenues totalling £3,237,370, an increase of £208,335 over the previous year, while operating expenditure increased by only £4,054 (before appropriation of the £150,000 reserves) to £2,960,338. Interest on capital during the year amounted to £142,893, and loans repaid to £253,350.

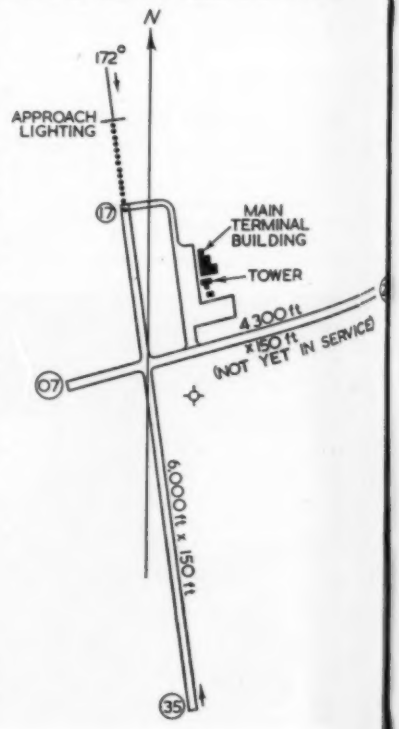
No costs nor c.t.m.s flown are given in the sketchy press release and until the annual report is received no clear picture can be defined as to how the carrier is progressing. Looking at the financial results the carrier has had a remarkable year, increasing revenue by approximately 7 per cent, while expenditure hardly increased at all. Passenger traffic increased in 1960-61 by 13 per cent to 201,004 and freight increased by 14 per cent to a rather small total of 2,110 tons. Much of the passenger increase is largely due to the carrier's activities in marketing all-inclusive seaside holidays to Cape Town in conjunction with Union Castle. CAA still operates unprofitable Beaver services in Barotseland and Nyasaland, together with DC-3 services to Fort Jameson and other points which offer little prospect of worthwhile returns in the immediate future.

QUESTIONS ABOUT SAFETY

AS forecast in last week's issue, several questions in the House have been asked on the independents' safety record. Mr Strachey (Lab, Dundee West) asked the Minister of Aviation whether he was aware of the growing public concern over the recent accidents to aircraft belonging to private airlines, including the BKS Dakota that crashed near Carlisle on October 17, and also the number of fatal accidents per million passenger-miles flown for independents and corporations respectively during '960 and 1961 to date. Mr Strachey also wanted to know whether the Minister would issue new and stricter safety regulations for all aircraft on charter flights.

Mr C. M. Woodhouse, the new PPS to the Ministry of Aviation, replied that the Minister was aware of the growing public concern at independent accidents, and was on that day (October 18) on a flight (to Stavanger in an RAF Comet) gaining background knowledge of the problems involved.

Mr Gresham Cooke (Cons, Twickenham) asked if the route testing of pilots going overseas on charter flights was the same as for scheduled flights, and was the Minister convinced that the navigational equipment on charter aircraft was as good as on scheduled aircraft. Mr Woodhouse said that the regulations governing navigational equipment were exactly the same for charter as for scheduled operators, and went on to explain the function of air operators' certificates; he did not answer the question about route testing. Mr Mason and Mr Cooke both pressed for an inquiry into charter operations, while Mr Strachey wanted an inquiry "into the whole question of whether there is anything in charter flying as such which makes it more dangerous."



This is the general layout of Cork's new airport; the inauguration was on October 16 *(see page 668)*

SIR WILLIAM HILDRED REPORTS

THE 17th Annual General Meeting of IATA opened in Sydney last Monday. The Australian Prime Minister, Mr R. G. Menzies, and the Minister of Transport, Mr S. Paltridge, attended the session on Monday at which Sir Hudson Fysh, chairman of Qantas, took office as president of IATA. A review of the meeting, which ends tomorrow, October 27, will appear in later issues. Meanwhile the report of Sir William P. Hildred, IATA's director general, is summarized here.

"WITHIN the last three years," says Sir William Hildred, "airline expenditures on landing fees alone have increased by one-half as against a rise of only one-third in total operating costs." Rising government charges for landing and navigation facilities are, he says (beating an old IATA drum harder than ever), making lower fares more difficult. He estimates that the landing fees paid by scheduled airlines are almost three times their operating margin of $57m (approximately £20.4m) before taxes. Citing "a depressing number of individual cases of increased charges," he singles out the UK and Canada for particular criticism. The most damaging charge of all for the industry as a whole was, he says, the 33⅓ per cent increase in landing fees imposed by the Ministry of Aviation. Sir William refers to his visit to the Minister of Aviation and his appearance before a Parliamentary select committee. He says that the Minister applauded IATA's consistent policy of trying to produce low fares, and gave it his blessing. He then proceeded to make it impossible by putting up his charges by another £2m.

IATA is not opposed to landing fees, Sir William points out. The Association has long accepted them as a normal cost of operation. "We are," he says, "willing to pay our fair share of airport costs. But we maintain that it is unfair to hold us solely responsible for providing them, as some governments would have it."

Sir William emphasizes, not for the first time, that airlines are not the sole users and beneficiaries of airports, neither are passengers who often pay their share as well through passenger service charges. As regards airport costs, he points out that the airlines have no control over the nature of the facilities provided and are allowed to give precious little advice to the authorities. "In many places," he asserts, "air terminals have been constructed not merely to serve air traffic, but to advertise the prestige of the country or locality or to satisfy the artistic imagination of an ambitious architect. . . . Certain administrations have made it clear that one way or another they expect to collect from the airlines the full capital cost of their airports—marble, mosaic, chrome trim, gold door-knobs and all." In fairness, Sir William adds that some governments have been more realistic, and charge to recover the operating costs of the airports—anticipating only a partial eventual recovery of the capital cost.

In his report Sir William says that, from the financial point of view, 1960 appears to have been worse than 1959. World airline operating revenues for 1960 were $5,505m as against expenditures of $5,448m, which leaves a margin of 1 per cent (or $57m) before payment of tax and interest. "This margin is just ridiculous to meet the demands of a growing industry or the pressures of rising costs," Sir William says, adding that the financial situation of the industry is precarious and "an affront to commonsense."

Sir William comments on the supersonic transport as "the next astounding technical challenge on our horizon." The development of a supersonic transport now seems inevitable, he says, because it has become a matter of declared national prestige for governments. "Any type of supersonic transport will be expensive beyond all previous experience in aviation. It would be utterly beyond the capability of either airlines or manufacturers to finance its development." If governments, as they had indicated, wished to recover their investment through the selling price to the operator, "this may be salvation for the manufacturer but fatal for the airline."

In his summing up Sir William says: "This has been a turbulent year of transition." He points out that there will probably be several more such years ahead, though he remains optimistic about the future. He emphasizes that the time it will take to get through the rough patch, and "the state in which we emerge from it depends only partially on our own efforts." He counsels the airlines to concentrate their efforts on reducing fares, because lower pricing is the key to the industry's future. He asks for the co-operation of governments who control large areas of airline costs.

SLUSH ON TEST

TESTS have recently been conducted by America's FAA to collect information on the retardation effects on take-off performance of slush and water. The FAA asked Britain's Department of Scientific and Industrial Research, who have been conducting tests of a similar nature, to send out a team to assist in the trials. The DSIR team took with them their high-speed trailer (with a Jaguar for towing purposes) which measures slipperiness on the runway at speeds of up to 120 m.p.h. The trailer unit was originally designed to study friction problems on wet surfaces. Assistance was also given by the American NASA.

The tests were conducted at the FAA experimental centre, Atlantic City, and the aircraft used was the Agency's recently acquired Convair 880M equipped with special tyres. With a test strip measuring 1,000ft × 50ft covered with slush up to 2in deep, and a 2,000ft braking strip covered with slush, foam and standing water, the aircraft made power-off deceleration runs at different speeds. Take-offs were also made from slush-covered strips at varying weights, as well as braking tests at different speeds over a variety of surfaces.

The pronounced retarding effect of slush is said to have surprised FAA officials. In one test the 880 was accelerated to 100kt, then steered at take-off power through a strip of pulverized ice 1in deep and 3,000ft long. The aircraft could not attain rotation speed of 124kt until just before it cleared the slush pack.

VANGUARD'S FIRST SIX MONTHS

TEN of BEA's Vanguards have now been delivered. Since they went into service with BEA some six months ago each has been flying at an average rate of 1,564hr a year. The corporation's chairman, Lord Douglas, writes in the current issue of *BEA Magazine* that Vanguard utilization should increase rapidly once the initial teething troubles are over, and as soon as the Tyne's low overhaul life is increased.

The Vanguard teething troubles to which the chairman refers have been the subject of numerous rumours and newspaper reports. Lord Douglas does not comment adversely on the aircraft or its engines, and refers to the low engine overhaul life as "inevitable during the first months with an entirely new type of engine."

The president of Trans-Canada Air Lines, Mr G. R. McGregor, however, has seen fit to refer less kindly to his airline's experience of Vanguard teething troubles. In an article in the *Toronto Telegram* he is reported as saying that initial Vanguard services gave "a most unsatisfactory account of themselves . . . they suffered from even more exasperating mechanical [delays] than might be reasonably expected of a new type. There have been numerous minor deficiencies and two major ones—the noise and the vibration level in the forward compartment is unacceptably high. So is the number of unscheduled engine removals due to mechanical faults."

A spokesman for Vickers-Armstrongs (Aircraft) says that the causes of all delays and unserviceability are fully understood and that modifications have been developed and are being embodied.

This recent photograph of Dublin Airport shows the extended main instrument runway (06/24) in the background. This runway, 7,000ft × 200ft, will probably be lengthened to 10,000 ft during the next few months. The almost-completed pier projects 200ft on to the apron. An unusual sight is all three Aer Lingus 720s on the ground

On the left is how the BAC One-Eleven will look in the markings of its first export customer, Braniff Airways. A note on the US airline's order for six with an option on six more appears on page 670. The engineering mock-up of the cockpit, as can be seen in the right-hand picture, has been completed in all essentials at Hurn. Seating is for two pilots with provision for two other crew members if required. This mock-up is duplicated at Weybridge for customer evaluation

AIR COMMERCE...

FREEDOM FOR FREIGHT

NO objections had been made, as *Flight* closed for press, to the Air Transport Licensing Board's proposal that UK domestic air freight rates need not be approved by the Board. The proposal was published in the October 4 issue of the Board's *Notices*; according to the Regulations, objections and representations must be lodged within 21 days.

The original closing date, October 25, has been extended by a further 14 days because BOAC was omitted from the original list of holders of the licences which the Board is proposing to vary. BOAC's inclusion brings the total number of licence holders affected to 22.

The Board has evidently decided that in air transport, as in all things, the best governed are the least governed. UK air freight rates have never, in practice, had to be officially approved, though they had to be when the new Act was introduced in 1960. It is obviously absurd for BEA, for example, to have to waste hours of their own and the Board's time arguing the case (to cite one example) for a new cargo commodity rate to Scotland to which British Railways object. The Board has used Regulation 6(1), which enables it to vary air service licences, to introduce its proposal to free UK air freight rates.

The development of the infant air cargo industry will clearly be furthered if operators do not have to go to the Board every time they want to introduce a new tariff. Very soon BEA are to introduce Argosies on domestic routes (see page 669) and freedom of initiative on tariffs will obviously help these aircraft to be fully exploited.

That no objection to this proposed emancipation of UK air freight has been made by surface operators is, perhaps, surprising. An objection could have been expected from the British Transport Commission, who would presumably represent British Railways and British Road Services, as well as others from private long-distance road operators.

2d A MILE TO SCOTLAND

THE ATLB has approved BEA's application to offer 3gn single night fares from London to Glasgow, Edinburgh and Belfast from November 1. Vanguards will be used to Glasgow and Edinburgh, and Viscounts to Belfast. BEA express themselves as being delighted by the Board's decision, and point out that at 2d a mile these are the cheapest regular air fares in the world.

A spokesman for the British Transport Commission said: "The Board's decision came rather late today [October 17], and we have not had much time to consider it. But the Commission will consider an appeal when they have seen the decision in writing." The question of an appeal is still being considered, a BTC spokesman told *Flight* as this issue went to press.

BEA IN AUGUST

ALTHOUGH BEA carried a record number of passengers—over 590,000—in August this year, load factors again fell. Passenger traffic during the month was 14.3 per cent up on the same month in 1960, while capacity ton-miles offered increased by 22.8 per cent. Passenger load factor was 68.4 per cent, a decrease of no less than 8.7 points, the lowest ever recorded for August since 1950. There are signs that current traffic results are encouragingly good; if this trend continues, and if there is not too much fog this winter, BEA may yet end the year with a profit. The corporation's campaign for the strict control of expenditure meanwhile continues.

BEA's Comet 4Bs, all of which have now been delivered, provided 28 per cent of the corporation's total capacity in August. The aircraft carried some 600,000 passengers for about 450m passenger-miles at an average load factor of 60 per cent. These jets now operate all BEA's eastern Mediterranean services and also serve Scandinavia, Switzerland, Frankfurt, Düsseldorf, Nice, Lisbon, Warsaw, Moscow and Malta.

Average utilization during the first year of Comet operations was 2,026hr, and by the end of August the annual average rate of utilization had risen to 2,132hr. This compares with 2,600hr per annum for Viscount 800s. Annual utilization rate for the Vanguard during the first five months of the financial year was 1,564hr. On August 14 the overhaul life of the Tynes was raised from 400 to 500hr, and trials are now in progress to permit a further increase to 600hr. This coming winter BEA is to carry out extensive modifications to the Tyne engines which, it is hoped, will raise the overhaul life to 1,000hr by the start of next summer's programme.

THE DUKE'S HERALD TOUR

MORE details are now available of the Duke of Edinburgh's forthcoming tour of South America by Herald; as reported in *Flight's* October 5 issue, BEA will provide the crews for this tour. Two Heralds will be used, one from BEA's fleet and the other a new aircraft from the Herald production line at Woodley.

The tour will begin at Georgetown, British Guiana, early in February and will finish at Tenerife two months later. There will be five BEA pilots, led by Capt W. J. Johnson, and two stewards, plus one BEA engineer and two from Handley Page.

The Heralds are expected to cover about 20,000 miles in South America, and will be flown from London to Georgetown fitted with extra fuel tanks for the long overwater crossing. The Duke will go to South America by BOAC Comet, it is understood, and the Herald flight will be the first long-distance flight outside BEA's normal area of operation since a BEA Viscount participated in the London - New Zealand air race eight years ago.

ARGOSY 200

FURTHER details are now available of the Argosy 200, which is now in production and which, except for the new fail-safe box-spar wing, is basically similar to the Argosy 100 series. The Argosy 200 can carry a maximum payload of 31,000lb, or 3,000lb more than the 100 series, over a range of 400 miles with full reserves, or a payload of 25,000lb over 500 miles with reserves. Maximum take-off weight has been increased by 2,000lb over the 100 series to 90,000lb, with corresponding increases in the zero-fuel and landing weights. The new wing reduces the basic structure weight by 1,000lb, but the same RDa.7/2 Dart 526s as on the 100 series are retained.

Weights: Max take-off, 90,000lb; max landing, 84,000lb.

Performance: Average cruising speed, 280 m.p.h. at 14,200 r.p.m.; normal cruising ceiling, 20,000ft; cruise ceiling (one engine inoperative), 17,300ft; range with 20,000lb payload and no reserves, 1,750 st mi; ultimate still air range, 2,760 st mi; balanced field length, max take-off weight, SL, ISA, 5,300ft; at 4,000ft, ISA plus 20°C, 82,000lb weight, 5,960ft; landing distance, SL, ISA, 80,000lb weight, unfactored, 3,120ft.

Three of the five Canadian CL-44s ordered by Seaboard World Airlines have now been delivered, and are at present operating on this all-freight carrier's scheduled services between New York and Europe, as well as on MATS charter work. It is possible, if government approval is forthcoming, that joint CL-44 services with Lufthansa will be operated in the markings of both carriers

MOUNTAIN SHADOWS

MANY questions have been asked in recent weeks about independent-airline safety standards, but no one has yet drawn attention to the fact that, in less than four years, six aircraft operated by independents have flown into mountains or high ground, with the loss of 156 passengers and crew. The latest was the BKS DC-3 on October 17 (see page 674). The following table tells the disquieting story:

Date	Aircraft Type	Operator	Fatalities		Location	Circumstances
			Pass.	Crew		
27. 2.58	Bristol 170	Silver City	35	—	Winter Hill	Hit high ground *en route*
23. 4.59	Super Trader	Air Charter	—	12	Mt Suphan Turkey	Hit mountain *en route*
19. 8.59	DC-3	Transair	29	3	NE of Barcelona	Hit mountain *en route*
9. 8.61	Viking	Cunard Eagle	36	3	21 miles NE of Stavanger	Hit mountain in approach phase
7.10.61	DC-3	Derby	31	3	Canigou	Hit mountain *en route*
17.10.61	DC-3	BKS	—	4	9 miles E of Penrith	Hit high ground on approach

It would be naïve in the extreme to suggest that any conclusion can be drawn from this monotonously similar sequence of tragedies. But it is reasonable to ask whether even one of these accidents might have been avoided had the aircraft concerned (all, incidentally, were piston types) been fitted with cloud/collision-warning radar. Four of the six accidents occurred *en route*, when the incidental terrain-painting properties of radar can warn crews in doubt about their position or safety height of the proximity of high ground.

In the USA the FAA has made the installation of radar mandatory on all US civil transport aircraft, with the exception of the DC-3 and the C-46, which cruise above 25,000ft. The installation of radar is not mandatory in this country, though of course it is fitted by BOAC in 707s, Comets, DC-7Cs and Britannias, by BEA in Vanguards and Comets, and by Cunard Eagle and British United in Britannias, DC-6s and Viscounts.

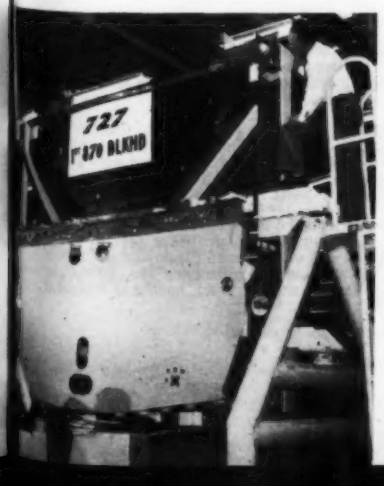
A Ministry of Aviation ruling of the kind applied by the FAA nearly two years ago now would obviously cost the UK airline industry a lot of money—as it has the US industry. The primary contribution of radar to air safety is in the avoidance of bad weather. Terrain-painting provides a useful cross-check on navigation; but its value also to crews who are uncertain of their position or safety height is not to be disputed. Asked by *Flight* last week whether the Ministry is proposing to make mandatory the fitting of radar in British civil aircraft, a spokesman said: "We have been discussing with operators for some time the possibility of introducing legislation to make the fitting of radar mandatory on certain types of aircraft on certain routes."

FIRST SUPERSONIC ORDER?

AT the end of a conventional announcement that Panair do Brasil had signed a contract with Sud-Aviation on October 16 for four Caravelle 6s, with an option on two more, *Interavia Air Letter* records the surprising (and as yet unconfirmed) news that Panair's contract also includes a letter of intent for the purchase of three supersonic Super Caravelles. If this is so, it will go down in history as the first commitment entered into by any airline for supersonic re-equipment; and it is the more surprising because Panair do Brasil has not (so far as is known) been among the handful of airlines that have expressed any enthusiasm for supersonics—as have Qantas, Continental and Lufthansa.

Delivery of the first Caravelle 6 is scheduled for next April, the second in May and two more in June, with the two optional aircraft following 18 months later, if ordered.

Not surprisingly, no delivery dates are quoted for the Super Caravelle; this "contract" was negotiated by Douglas, who will be in a position to benefit from Sud's supersonic design experience and who eventually, perhaps, will sell Super Caravelles to American operators. It is interesting to speculate on whether Pan American, which is reported to have sold its 30 per cent holding in Panair do Brasil, had any influence on the Brazilian carrier's supersonic aspirations.



Historic milestone in the production of the Boeing 727 was the loading of the first jig, an event which took place recently at the company's transport division at Renton, Washington. The component is the first fuselage bulkhead. First flight will be in the autumn of 1962

UN CRASH STILL A MYSTERY

AN extensive investigation into the Transair Sweden DC-6B crash at Ndola in which Mr Hammarskjold was killed has so far failed to determine any probable cause. The report issued by the Rhodesian Federation Government states that it will, as soon as possible, invite nominations to a five-member public commission of enquiry to continue the investigation. Nominees would be invited from Sweden, Britain, ICAO and the United Nations.

The report says that the crew issued a false flight-plan before leaving Leopoldville, giving the destination as Luluaborg with Leopoldville as an alternate. According to a Rhodesian Government statement, the true destination of Ndola and the route to be taken were kept secret from the aeronautical authorities.

The investigators' task cannot have been made easier by such security precautions, and there is always the risk in an accident of this nature of political pressures being brought to bear to suppress vital information. The initial enquiry showed that the DC-6B's undercarriage was down and locked, and the flaps were partially extended; the engines were operating "under some power" at the time of impact.

Details and times of the flight are given in the report, which show that the DC-6B maintained radio silence for four hours before calling Salisbury, when the destination was given as Ndola. The aircraft reported over Lake Tanganyika half an hour later, indicating that it was not flying on the direct Leopoldville-Ndola route. A preliminary report issued by pathologists (*Flight*, October 5) after detailed examination of the bodies dispelled suggestions that the aircraft was fired on or that there was an in-flight explosion. The Federation Government statement said that the board of enquiry had been in continuous session since September 18 and was "still in the process of collecting all the available evidence."

CATHAY PACIFIC TO ORDER JETS?

RECENTLY rumours have been circulating that Cathay Pacific, the British independent based in Hong Kong, would order jets to meet competition on their Far East services, although the carrier has always denied these stories.

A correspondent in Australia reports that Mr Ansett, whose company has a shareholding in Cathay Pacific (BOAC also has a 15 per cent share), has said that Cathay has definitely ordered one Convair 880. He also said that the company is to suspend its twice-weekly Sydney-Hong Kong Electra service in November, because Qantas will introduce Boeing 707s on their Sydney-Hong Kong and Sydney-Tokyo services before Christmas. Qantas at present operates four services weekly on the Sydney-Hong Kong route with two continuing to Tokyo, and one on the Sydney-Tokyo route, all with Electras. Due to the introduction of 707s by Qantas, CPA's Electras will not be competitive, particularly as their frequency is only twice-weekly. CPA's routes are highly competitive and it is not surprising that the carrier, although clearly not wanting to re-equip with jets due to the heavy financial commitment involved, has had to reconsider its earlier decision.

According to our correspondent, Mr Ansett is making a stronger-than-ever bid to buy Cathay Pacific, in his effort to expand into the overseas business.

This is the first picture of the Argosy in the colours of BEA, who are to take delivery of the first aircraft on November 6. A note on BEA's plans for introducing Argosies appears on page 669

AIR COMMERCE..,

500,000 BRITANNIA HOURS

SOME time during the third week in October Britannias had flown their 500,000th revenue hour on scheduled or charter airline operations. This total does not include the growing number of hours flown by RAF Transport Command's 23 Britannias, and it has been achieved by a relatively small number of aircraft operating at high utilizations. Bristol estimates that Britannias have earned more than £300m in passenger revenue, or nearly £350m with freight and mail revenue added.

For some time past the average utilization for all airline Britannias has been about 2,850 hours yearly, with peak-season daily rates of 11-12hr not unusual. El Al's four Britannias all exceeded 3,000hr in 1960, and one reached 3,400hr, while British United's four aircraft averaged nine hours a day throughout the year ending June 1960—the equivalent of an annual utilization of nearly 3,300hr. Britannias last year were responsible for 52 per cent of all revenue hours flown by BOAC's fleet, and 12 of the corporation's Britannia 102s have already exceeded 12,500hr.

The Proteus 705 of the Britannia 102 at present has an overhaul life of 2,400hr and some engines are being run to 2,800hr in preparation for an extension of this figure.

NORTH ATLANTIC MEETING COMPLETED

THE ICAO North Atlantic regional meeting has completed its work in Paris (*Flight*, September 21). The meeting took action to cope with the traffic congestion in the region, and to allow airlines maximum commercial freedom to plan their routes and arrival/departure schedules compatible with safety. It endorsed a practice, recently followed by Canada, which directs air traffic in specified bands of airspace so as to enable full use to be made of all flight levels for one-way traffic. In such cases the longitudinal separation between aircraft flying at the same level and on the same track may be reduced from 30min to 20min, but the vertical and lateral distance between aircraft will be maintained at 2,000ft and 120 miles respectively.

The meeting thought present needs would be met if the obsolete Loran at Frederiksdal in Greenland was replaced by a new 160kW transmitter rather than by a high-powered 1,000kW transmitter. The submarine telecommunication cable across the North Atlantic from Scotland through Iceland and Greenland to Canada, which will be completed late in 1962 under joint financing arrangements, was also the subject of extensive consideration.

For the future the meeting set long term technical goals. It envisaged the consolidation of areas in which air traffic control is executed. This will also require the development of a single integrated system of navigation aids and the reduction of the number of meteorological centres. Automation in the operation of air navigation services is foreseen. A plea is made for intensified international co-operation to provide a more efficient and more economical air navigation service than present day practice permit.

MORE FRIENDSHIPS ORDERED

Two repeat-orders for Fokker Friendships, bringing the total number of F.27s ordered to 206 (Fokker 120, Fairchild 86), are announced,

All Nippon of Japan has ordered four more Series 200s, to bring its fleet to ten; and Indian Airlines Corporation has ordered five more Series 100s, to bring its fleet also to ten.

BREVITIES

The US Department of Justice is co-operating with the CAB to decide whether pool agreements by US carriers would violate anti-trust laws.

According to *Interavia*, the Polish airline LOT is hoping to get traffic rights for a North Atlantic service, and has approached BOAC about the possibility of chartering Britannia 312s.

Maritime Central Airways has sold its Viscount 805 to Aer Lingus. This aircraft, previously owned by Cunard Eagle before passing to MCA, is being converted from V.805 to V.808 configuration at Hurn before joining the Aer Lingus fleet as "St Canice."

Residents of South Nutfield are to explore the possibility of legal action against British United Airways' helicopter operations from Redhill for training Royal Navy and Royal Marine pilots. The objection is on the grounds of alleged noise.

G. A. Piskov, deputy chief of Aeroflot's passenger department, speaking recently in Moscow said that in 1960 Soviet aircraft carried as many passengers as in the two previous years combined; Il-18s, An-10s and Tu-114s carry 60 per cent of the total volume of internal air traffic. In August alone, Aeroflot carried about 100,000 passengers to and from the Black Sea holiday resort of Sochi.

On October 17 a BKS Dakota on its way from Leeds to pick up a charter party of 36 farmers at Carlisle crashed on the approach, into a peak on Newbiggin Fell. The flight crew of three and the stewardess were all killed; there were no passengers on board. The DC-3 is believed to have flown into the peak during a sudden deterioration in visibility. A further note on the accident is on page 673.

Under a proposed amendment to the US Civil Air Regulations the FAA is proposing that all non-airline turbine-powered aircraft weighing more than 12,500lb, and all aircraft in this weight class certified to fly above 25,000ft, should carry flight recorders. At present it is mandatory for all airliners which fall into the above categories to carry this equipment.

A BOAC Boeing 707 on a flight from Montreal to London on October 21 suffered a pressurization failure. The aircraft was flying at 27,000ft at the time and the captain brought the aircraft down to 10,000ft. The aircraft had to hold to use up fuel before landing at Montreal. According to one passenger the emergency oxygen system did not function properly. BOAC are carrying out an investigation.

Fairchild has begun production of the F-27F at the rate of one per month for eight months; the first aircraft came off the line towards the end of September.

Lord Rennell of Rodd, a member of the Board of BOAC, has succeeded Capt J. W. G. James of BEA as chairman of the Board of Governors of the College of Air Training.

A layout for a hovercraft terminal and hotel against the cliffs of Dover has been designed by Timothy Murgatroyd, who discusses his scheme in the October 13 issue of *The Builder*.

The Council of ICAO has elected J. H. Riddoch of the UK, F. J. Rodas of Guatemala and B. E. Martinez of the Philippines as its vice-presidents for the coming year. Dr Assad Kotaite of the Lebanon was re-elected chairman of the Air Transport Committee.

As from December 5, all SAS intercontinental routes will be flown by DC-8s, which will be introduced on the South American route on that date. DC-8s will be introduced on the South African route on November 2 in place of the Convair 990 which would have taken over from DC-7Cs on this route.

Mr Norman Manley, Prime Minister of Jamaica, said at Kingston on October 13 that Jamaica will take steps to establish an international air service of her own after independence (presumably by arrangement with BOAC). There were aspects of air travel into the Caribbean, said Mr Manley, in which Jamaica was "peculiarly interested."

RANSA (Rutas Aereas Nacionales SA) have converted a Stratocruiser for all-cargo operations between the US, the Caribbean and Venezuela; it is due to go into service shortly. Capacity payload is 40,000lb, and new cargo doors measuring 78in × 80in give access to the more than 6,000 cu ft of hold space.

TACA International Airlines is sueing Rolls-Royce, Capital and United for £275,000 damages, following the crash of one of their Viscounts in Nicaragua two years ago in which 15 people were killed. TACA charges Rolls-Royce with negligence in the manufacture of a Dart, and with supplying defective parts.

According to foreign press reports the British Aircraft Corporation is negotiating with Communist China a possible order for up to 20 Viscounts. A Vickers team has, it is said, been in China and the deputy director of the Chinese civil aviation administration has visited the Vickers factory. A BAC spokesman was last week unable to comment on these reports.

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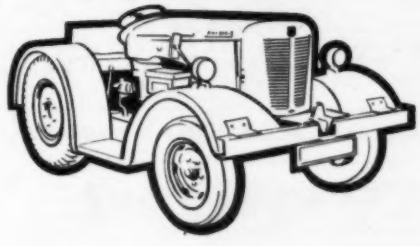

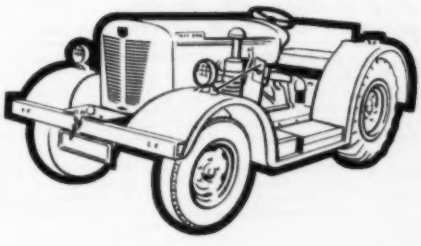

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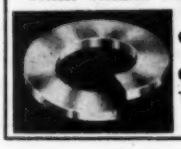
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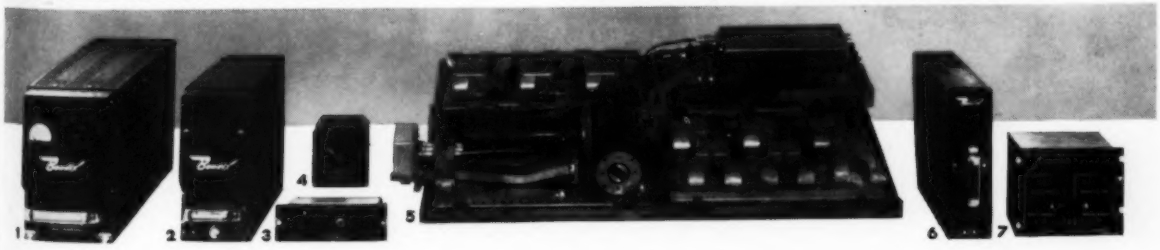

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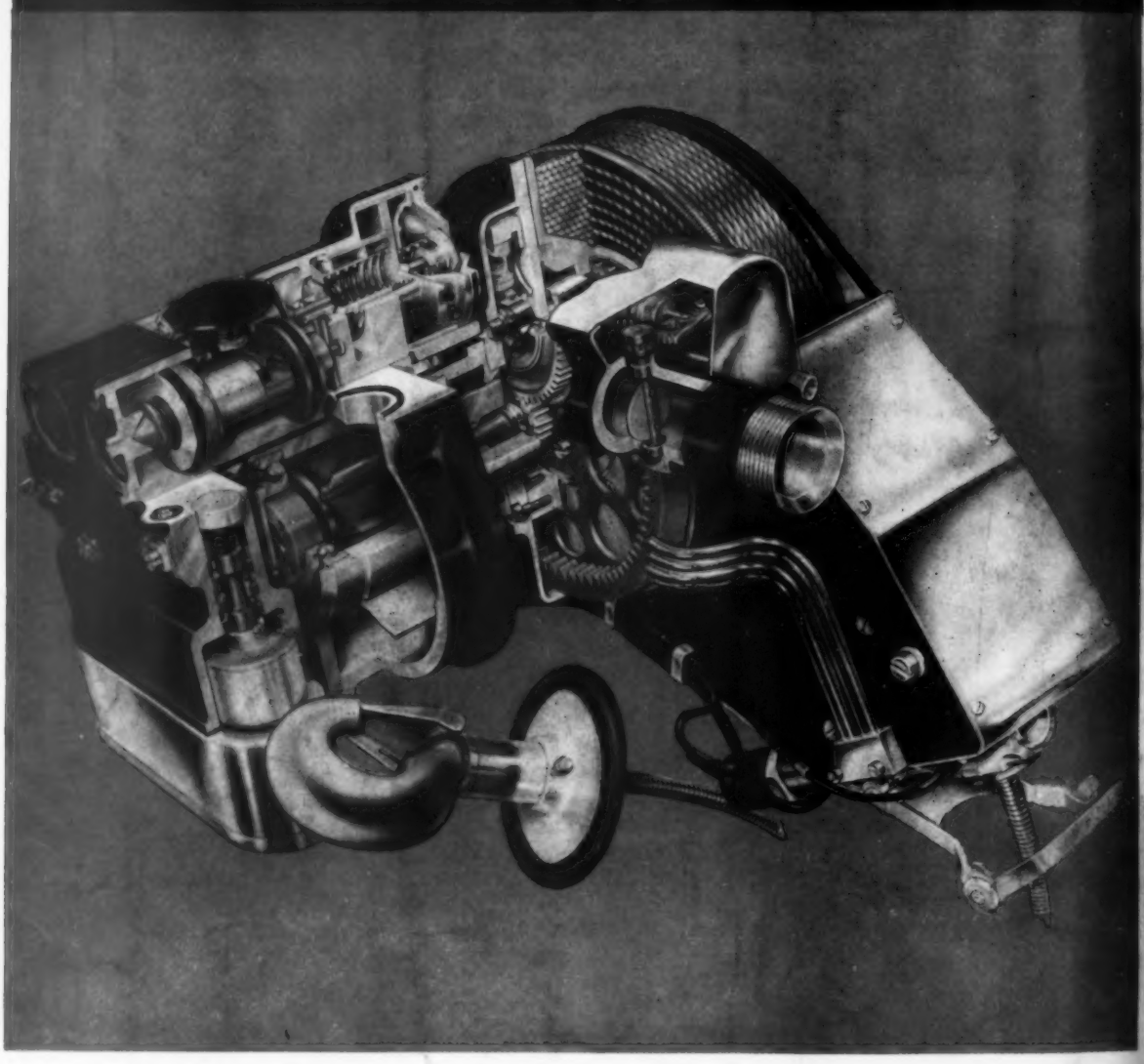

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